

Midwest Engineer

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TECHNICAL EDUCATION AND SOCIETIES — PAGE THREE

WSE MEETINGS — PAGE TWO

Vol. 7

MARCH, 1955

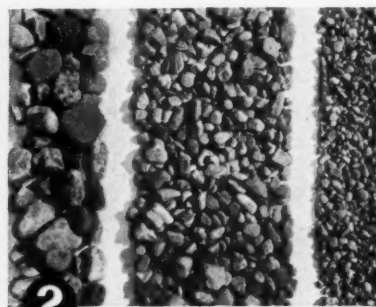
No. 10, Part 1

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1 Always protect your portland cement from moisture. Store it on raised planks and keep well covered with a waterproof tarpaulin.



2 Aggregates must be hard, clean, durable, free of foreign matter and well graded up to the largest size practicable for the job.



3 Design the mix for the job. These 3 (stiff, medium and wet) all are suitable, depending on where and how they are used.



4 Measure amount of moisture in sand by weighing, drying and reweighing sample. Consider this as part of the mixing water.



5 According to the conditions to which the concrete will be exposed and the strength desired, set mixer gauge for needed water.



6 Measure aggregates carefully. A platform scale makes for quick and accurate measuring and more uniformity from batch to batch.



7 Place the dry materials in the skip. Transfer them to the drum while the water is being added. Then mix for at least one minute.



8 Use of rubber-tired buggies reduces chance of segregation. Spade or vibrate mix enough to settle and work it against forms.

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Serving the Engineering Profession



MARCH, 1955

Vol. 7, No. 10, Part 1

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COVER STORY

Scale models of storage tanks are set up prior to simulated bomb blast in 150-foot "shock tube," designed by Armour Research Foundation of Illinois Institute of Technology, Chicago. The tube, 6-feet in diameter, is the largest laboratory device yet developed for studying the effects of blasts on structures. It was built for the Air Force in Gary, Ind.



April 4, Hydraulic, Sanitary and Municipal Engineering Meeting

Speaker: Albert L. Tholin, chief engineer, Advance Sewer Planning, Bureau of Engineering, City of Chicago.

Subject: "Progress in Chicago's Sewer Construction Program." This will be a progress report on sewer construction in Chicago since World War II, and an inventory of remaining needs. The inundation of Chicago late last year gave a dramatic demonstration of the importance of an adequate metropolitan sewer system. This talk will include new concepts regarding storm runoff and special design features of recently constructed sewer systems.

April 6, Noon Luncheon Meeting

Speaker: Leo J. Ritter, Jr., vice-president, Howard Hanson, Inc.

Subject: "Highways in the Philippines." This speaker spent two years as a highway consultant for the government of the Philippines. He will give a brief history of the highways there, the damage done to them during World War II, and the rehabilitation program put into effect. He will also relate some of the unusual problems encountered. Slides will help illustrate the talk.

April 11, WSE General Program

Speakers: Miss Lillian Stemp, safety engineer; Mrs. Martha Nydham, director of store planning and decorating, Wieboldt Stores Inc.; and Mrs. A. Lawrence Griesel, engineer and homemaker.

Subject: "Safety and Efficiency in the Home." The modern industrial plant is a model of efficiency. In addition, it is amazingly safe. But how does the average home compare in these two respects? Despite the modern equipment now available for the home—automatic washer, gas and electric stoves, deep freezer, yes, and even power lawn mowers—the average home is neither very efficient nor safe. Probably few engineers would want to live in a house where industrial efficiency held sway. Still, most of them would like to see

some improvement—it would make their wife, children, and themselves happier. They would like to see a great increase in safety. It is more dangerous spending a day at home than spending a day crossing city streets (consult insurance statistical tables). What then should be done to improve these conditions? Should ordinary good plant management, with its up-to-date tools and time-saving methods and safety measures be brought into the home? That might be an answer, or the answer. To learn the answer of the three persons on the panel, at least, be sure to attend this meeting. Bring along your wife and other guests, too. You'll have a pleasant evening and get some good ideas, too.

April 13, Noon Luncheon Meeting

Speaker and subject not available at this time. They will be announced in the near future.

April 19, Electrical Section Meeting

Speaker: Frank McStay, product manager, Kyle Product Sales, in association with R. C. Kirk, chief engineer, Kyle Products, Line Material Co.

Subject: "Line and Substation Application of Oil Circuit Reclosers." This will be a comprehensive presentation of recloser application to electric distribution systems. Color slides and line diagrams will supplement the oral description. Working models of single- and three-phase reclosers will be available for inspection.

April 20, Noon Luncheon Meeting

Speaker: John J. Ahern, director of Fire Protection and Safety Engineering Department of Illinois Institute of Technology.

Subject: "You Are Living in a Dangerous Age." Yes, your plant or home can collapse or be the scene of an explosion. Be sure to hear this highly interesting talk, amply illustrated with pictures by one of the foremost experts on the subject of prevention. This talk will be of interest to all, especially to owners and operators of plants, and structural and similar engineers. We're counting on seeing you.

April 25, Joint Meeting AIMME-WSE

Speaker: Dr. Frank H. Reed, chief chemist, Illinois State Geological Survey.

Subject: "The Unique Position of Illinois Coals in the Steel Industry." Fifteen million tons of coal are coked annually in the Chicago district for the production of pig iron, and 22 percent of the steel produced in the U.S. comes from this district. Only bituminous coals are used for blast-furnace coke. The State of Illinois has larger deposits of bituminous coals than any other state east of the Mississippi. Illinois coal can be used to save money in pig iron production, but too little is known about the coking process. Do you want to find out about it? Then this is an excellent time to do so, and you will enjoy a pleasant and interesting evening.

Technical

Education & Societies

By John T. Rettaliata, MWSE

In view of the critical manpower situation existing in the nation today, and the constant challenge to our technological superiority, it is appropriate that the Society of American Military Engineers, in cooperation with others, sponsor this Military-Industrial Conference. The theme of the Conference, "The Development and Utilization of Our Technical Manpower," should elicit constructive comment on this important subject.

This paper, on technical education and technical societies, will deal primarily with the role that education can play in alleviating the manpower crisis, and also the assistance that can be rendered by professional societies. Education, being intimately associated with the motivation, training and supply of engineers, may be expected to contribute to the solution of some of the problems that prevail.

As many of you may be aware, for a long time there has been concern about the steady decline in the number of college engineering graduates, and the urgent need of positive action to reverse the trend.

There is concern on several counts. There is substantial evidence that the technological superiority of the United States, as the keystone of national defense, is being threatened by a rapid build-up of engineering manpower by Soviet Russia.

Additionally, we know that the fulfillment of the needs of just our domestic economy demands a greater supply of engineers than is currently available. Our future productive capacity will be taxed to the utmost to satisfy the requirements of a population predicted to reach 200,000,000 people by 1975.

Dr. Rettaliata, president of Illinois Institute of Technology, presented this address before the Military-Industry Conference in Chicago on Feb. 10, 1955.

The pre-eminent position of the United States as the strong-hold of the free world, and the home of the highest standard of living ever known in this or any other nation, is due primarily to our industrial "know-how," the result of technological achievements. And, make no mistake about it, it is the technological superiority of this country, more than any other factor, that is deterring the forces of aggression. Maintenance of this superiority requires intensive encouragement of scientific learning, training of science teachers, promotion of scientific study, and an understanding of the importance of technology.

Let me say here, it is heartening to note the widespread awareness of, and interest in, the problems of education that are crying for solution, particularly as they affect technological education. This is true of educators, industrialists, technical societies, and government alike. At the national level, evidence of that recognition is the White House Conference on Education slated for this fall in Washington. The conference will enable lay citizens and educators to discuss their school problems and seek solutions.

It also will afford an excellent opportunity to focus attention on the increasing importance to the security of the United States of trained personnel and technological supremacy, rather than dependence on mere numbers, as defense against a potential foe whom we cannot hope to match man for man on the battlefield.

The position in which we find ourselves with respect to the decreasing numbers of college graduates in engineering has been publicized widely. I believe, however, that a brief review of the situation and a comparison, so far

as it can be made, with progress in the Soviet Union is appropriate for a more thorough understanding of the urgency of our needs.

A critical examination of what we know of Russian technological developments is cause for real concern. The plain fact is, we no longer enjoy a comfortable margin of accomplishment. Our nuclear weapons monopoly ceased several years ago, and it seems apparent that the Russians have the knowledge to jeopardize our leadership.

How did this come about? At least part of the answer lies in the importance Russia attaches to scientific and engineering education. While we have been deploring our lack of an adequate supply of scientists and engineers, the Reds steadily have been increasing the numbers of such graduates. Consider the following comparison of the numbers of engineering graduates in the two countries for each of the last four years.

In 1951, the total of such graduates in the United States was approximately 41,000, compared with 30,000 reported for Russia; in 1952, 31,000, against 30,000; in 1953, 24,000 here, compared with 40,000 in Russia, and in 1954, around 20,000 here, and about 54,000 in the USSR. The score for the four years: 116,000 in the United States, against 154,000 in Russia.

As it stands now, in this country it is estimated we have about 600,000 engineers and some 200,000 scientists. Reports indicate that the comparable totals for Russia are 500,000 and 150,000. While we presently have the advantage in numbers, it is apparent from the foregoing figures that Russia is increasing its supply more rapidly than we.

Nor is there a very heartening prospect of materially reducing the edge

Russia has in annual additions each year to its supply of engineers. Even if we are to apply the favorable engineering graduation-enrollment ratio for the 1952-53 school year of 57 per cent, the probable number of engineering graduates will be about 23,000 in 1955; 30,000 in 1956, and 34,000 in 1957. No similar projection is possible to cover Russian prospects.

These figures are discouraging when it is considered that American industry needs a minimum of approximately 30,000 new engineers each year merely for replacement and filling new positions.

There is another important comparison of the Russian and American educational systems which gives even greater significance to the numerical comparison.

In higher education in the United States the objective is to prepare the scientist and engineer for civic as well as professional responsibility. Therefore, more of the humanities and liberal studies are included in the curriculum

to produce more broadly trained individuals.

The Soviet engineering program, which exceeds four years' duration, is devoted mostly to narrow, intense specialization, with the result that the Russian engineer has had more intensive training in his particular technical field than his American counterpart. Actually, in major subject matter, his training would be equivalent to approximately the master's degree level here.

Undoubtedly, the reduced numbers of engineering graduates in recent years reflect, principally, the low birth rates of the 1930s. It is believed also that the Bureau of Labor Statistics report of 1950 predicting an oversupply of engineers discouraged many high school graduates from embarking upon a career in engineering.

However, our major concern is with the future, and with this in mind let us examine briefly the situation with respect to teachers and curricula in our high schools.

It is widely recognized that there is a pronounced trend in the secondary

schools toward more general education, with declining importance being attached to mathematics and science, the prerequisites for engineering and science programs in the colleges.

The Department of Science Teaching at Columbia University has reported that an increasing number of small high schools throughout the country have abandoned courses in physics and chemistry, and many offer mathematics only in the ninth grade. It was noted further that even in those high schools where physical sciences and mathematics are offered, the enrollment of students in these elective courses continues to decline.

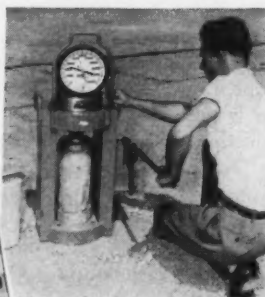
The decline in the study of physics, the importance of which in our national life increases almost daily, is a striking example. The National Education Association reports the percentage of high school students enrolled in physics classes shows a continuously downward trend from 22.8 per cent in 1895 to only 5.8 per cent in 1948. Since physics is usually studied only by seniors, this
(Continued on Page 11)

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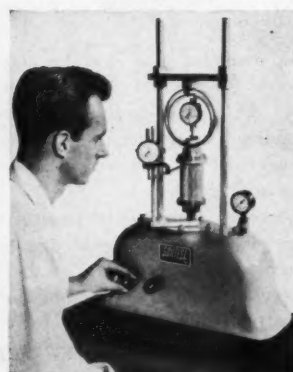
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Youth's Outlook Said Unparalleled

Today's youth can look forward to a life of unequalled opportunity and accomplishment as the result of developments in science and technology, more than 100 teen-age "inventors" were told late last year.

Addressing a city-wide meeting of members of YMCA Inventors' clubs in the La Salle hotel, Chicago, Dr. John T. Rettaliata, MWSE, president of Illinois Institute of Technology, depicted a "rosy future" for the young men and women during the next half-century.

Dr. Rettaliata praised the work of the "Y" clubs, adding that "the kind of creative thinking you are developing is something that is sorely needed in the solution of the world's problems, now and in the future."

Attributing America's greatness to its concepts of freedom and liberty, he urged their preservation as the base upon which can be built the future of tomorrow. Among the things he foresaw for his audience were:

—A longer life than any preceding group of boys and girls.

—Reduced illness, greater chance of recovery, and victory over many of the diseases that have been called the "great killers of mankind."

— Shorter work week, probably of

30 hours' duration, about half the number required of the grandfathers of present-day high-school students.

—Incredibly faster and more comfortable travel between continents.

—Exploitation of the seas to support an expanding population, which may approach the quarter-billion mark in the United States by the end of the 20th century.

—Development of atomic power for industrial peacetime uses.

—Substantial progress in the social and other sciences as a guide to more intelligent and purposeful planning of careers.

The Illinois Tech president urged the youngsters to continue their inventors' club activity.

"Through your projects," he said, "you are beginning to get acquainted with fundamental concepts, in your own way, in company with your friends and schoolmates, and you are doing it because you want to."

"What you are doing may be of tremendous importance to your lives and careers. Unsuspected inventive talents may be revealed and developed."

Pointing out that some might find scientific activities to their liking, he said:

"As an engineer myself, I can tell you we can certainly use every one of you who is so inclined in the years ahead."

"We are growing and expanding at such a rapid pace that there is a serious shortage of engineers to help do all the things that have to be done. And it looks as though we shall need more and more engineers for a long time to come."

The dinner meeting was attended also by some 100 adult club advisors and prominent businessmen interested in the program. Originator of the club idea was a Chicago inventor, George Forsyth, who last year established a fund for development of the project.

Old Soldiers...

Indian relics are the newest hazard for road builders, according to Engineering News-Record, McGraw-Hill publication. Massachusetts' state turnpike authority recently requested contractors bidding on a five-mile stretch of toll road in the center of the state to watch out for Indian relics remaining from the 1665 Podunk Indian war against King Philip.

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Canadians Hear about "Alloy Age"

The need for greater numbers of engineers to meet the growing demands of the present "alloy age" was emphasized in Montreal early this year by F. L. LaQue, vice-president of the International Nickel Co., and manager of its Development of Research Division in New York.

Addressing members of the Montreal Chapter of the American Society for Metals at a meeting in the Spanish room of the Queen's Hotel, LaQue said it is no accident that the ages of man have been defined by the materials used for his civilization.

"It is no accident that the rise of civilization has been made possible by improvements in these materials from the stone age to the present alloy age," the speaker remarked. "Further advances will be determined by the extent to which the new needs of an age of electronics, atomic power and space power and space travel can be accommodated by even newer materials and ways of handling them.

"Mythology tells us that the ancient civilization of the Athenians was a joint gift of Hephaestus and Athena—the one the smith of the gods, skilled in metallurgy, and the patron of all artisans, the other the goddess of the arts and crafts, the patroness of inventors and the advocate of intelligence in the tactics of defensive war.

"Our present way of life based on the efforts of disciples of Hephaestus and Athena needs more recruits to their ranks if it is to flourish and even survive.

"Behind the iron curtain the rulers do not depend on recruits for their army of scientists and engineers—they just arrange that there be enough. It has been reported reliably that they are currently graduating about two and one-half times as many engineers as we are. At the same time, we are acutely aware of a continuing shortage of engineers for our expanding civilization and for the protection of our way of life and our precious freedoms.

"But, we do not propose to abandon any of this freedom by regimentation to insure that enough of our high school graduates will study in the proper branches of science and engineering to satisfy our immediate and future needs.

"If not enough students choose engineering, it cannot be because they have questioned the needs and rejected the opportunities. It must be because they have not questioned the needs and rejected the opportunities. It must be because they have not been properly informed of these needs and opportunities.

"Our engineering societies are prepared to give high school students a better understanding of what a career in engineering means. For example, the American Society for Metals will arrange through their local chapters to provide speakers and publications on the profession of metallurgy. Parents, teach-

ers or student groups who wish to enlist this guidance may secure all necessary help in making arrangements by communicating with the American Society for Metals at their headquarters at 7301 Euclid Avenue, Cleveland 3, Ohio."

In a technical discussion at the meeting, LaQue reviewed some apparent anomalies in corrosion, citing a number of instances where the nature, extent or location of corrosion appeared at first to be contrary to what might have been anticipated by casual consideration of the surrounding circumstances. He pointed out, however, that in each case detailed study showed that what happened could be accounted for readily by consideration of the scientific principles involved.

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Radio Interference Can Affect Nike

The nation's complex weapons systems will be affected seriously by how successfully the problems of radio interference are solved, a U. S. Defense department official has warned.

Most of the post-war advances in weapons are dependent upon complex electronic systems that often "jam" because of radio interference, John W. Klotz explained at a 2-day meeting at Armour Research Foundation of Illinois Institute of Technology, Chicago.

Klotz, secretary of the advisory panel on electronics to the assistant secretary of research and development, spoke at

the Radio Interference Reduction symposium sponsored jointly by the Department of Defense and Armour Research Foundation.

Of some of the weapons that could be affected, he listed the Nike antiaircraft missile, the continental air warning network, the new bombing system used by the Strategic Air Command, and modern jet interceptors.

As an example of jamming caused by radio interference, Klotz singled out the transmitter in one model of communications equipment. This transmitter, he explained, emits spurious radia-

tions at certain frequencies which render the plane's altimeter useless.

This same equipment also has been known to trigger the instrument panel light that indicates the airplane has flown over certain beacon markers on the landing field.

In many cases, he said, such failures could mean disaster in times of emergency or adverse weather.

Klotz also told of the Defense department program for reducing radio interference.

"Every area of equipment development has undergone some phase of the interference problem to insure that the equipment will operate effectively in the field."

He estimated the annual Defense department expenditure on the program in excess of \$200 million. One set of radar equipment alone required a \$2 million program of interference control to make it operate properly, he said.

The radio interference program extends beyond the development of jam-proof equipment for weapons, Klotz said.

Other fields also important to defense where interference control is important are power generators, X-ray machines, lighting fixtures, office accounting equipment, and even hand tools.

One electrical device generating unwanted interference, he said, can foul a circuit as effectively as the most strategically located enemy "jammer."

Klotz warned the electronic engineers at the symposium that tact and diplomacy must be exercised in advocating radio interference engineering.

"To the enthusiasts who want their equipment in the field now, the delays necessary to measure, analyze, and correct deficiencies from the interference control viewpoint seem intolerable.

"Yet, the additional effort may save the equipment from that severe penalty of inferior performance," he declared.

American People Heavily Covered

At least 11,290,000 workers are covered by some type of health, insurance or pension plan, according to data reaching the Chamber of Commerce of the United States.

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Hope To Avert Energy Shortage

An acute shortage of conventional energy sources in 20 to 50 years—with petroleum and natural gas production reaching a peak in about 10 years—was cited in New York City on Feb. 2 as one reason behind a proposed research program for the electric utility industry.

William A. Lewis, dean of the graduate school at Illinois Institute of Technology, Chicago, and Jesse W. Hobson and M. S. Oldacre, of Stanford Research Institute, Stanford, Calif., said the electric companies must consider future energy shortages carefully now.

In a paper before the winter general meeting of the American Institute of Electrical Engineers at the Statler hotel in New York City, the power specialists called for "more penetrating" research studies to analyze factors that affect demand upon the utility industry.

New techniques of planning for future growth are needed because simple projections of past power requirements do not give a true picture for more than

a few years ahead, they said.

Forecasts of electric load growth for 1975 show a "disturbing diversity of opinion," ranging from 225 million to 400 million kilowatts.

The paper advocated detailed studies of expected population growth and migration; of the agricultural, industrial, residential, and transportation needs of an area, and of how the energy needs may be met best.

"When new discoveries no longer are able to keep ahead of new demands, the available supplies will have to be conserved and limited to more exacting needs . . . such as liquid fuel for automobiles and airplanes and gas for residential heating.

"The remaining needs will have to be satisfied by using lower grades of petroleum residues and by the increased and more efficient use of coal, lignite, and other solid fossil fuels, or by nuclear and solar energy.

"A possible means to release oil for

power station fuel is the development of batteries for the economic operation of vehicles."

The paper pointed out a lack of fundamental knowledge of combustion processes is the weakest part of the present position, and that weakness can be overcome only by fundamental research.

Economic studies of load demand and fuel use are local problems, they explained, but the basic questions of fuel availability and processing are of such magnitude that they should be undertaken by energy-using industries as a whole.

They advocated the establishment of an industry association or other organization which would have such research as its major objective. Support of such an organization, they said, should come not only from the utilities, but also from fuel suppliers and equipment manufacturers.

They emphasized that all research activity must seek to lower electricity cost, recognizing "that the industry deserves to prosper only if it can compete with other forms of energy delivery."

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A fiery "saucer" of flame hovering in a specially-designed vacuum chamber may hold the key to tomorrow's faster jet engines or better furnaces.

Continuing man's thousands of years long search for ways to build a better fire, scientists at the Westinghouse Research Laboratories have produced flame in the shape of a flat disk.

The "saucer" of flame, the Westinghouse researchers point out, makes it possible to measure more accurately the exact temperature at all points of the flame. The ordinary cone of flame like that from a burning candle cannot be as accurately measured.

"How to maintain fire in a small space so as to liberate the most energy is what we want to find out," explained Dr. Raymond Friedman, of the Westinghouse Research Laboratories. "Such knowledge is important to any combustion process, particularly in jet engines, gas turbine power plants and similar applications.

"Our search is for the fundamental knowledge hidden in the flame we all take so much for granted. Where is the fire burning most intensely? What changes can be made to make the flame burn even more intensely?

The disk-shaped flame experimented with by the Westinghouse scientists is produced in a specially-designed vacuum chamber in which pressure can be varied from that found at sea level to 65,000 feet altitude. The flame has the characteristic of being stationary and suspended in mid-air above the burner.

At the maximum altitude mark it has been found that a flame nearly an inch thick and about 10 inches in diameter will burn evenly in its horizontal position.

Fine Wire Measures Heat

A movable thermocouple — an extremely minute platinum and rhodium wire half a thousandth of an inch thick — is used to explore the flame. Such a fine wire is necessary to avoid disturbing the flow of gases through the flame. A recording device is connected to the thermocouple, automatically measuring the temperature variation as the wire is shifted.

By making a mathematical analysis

of the temperatures and measurements of the "saucer," it is possible to deduce the size of the zone where heat is being liberated. Also, the intensity of the heat release in this particular zone can be determined.

The conventional conical-type flame was abandoned for these tests, Dr. Friedman explained, because it was difficult to trace the movements of the thermocouple through the cone; furthermore, complications are introduced by the curvature of the cone.

In Dr. Friedman's opinion, detailed knowledge of the "physico-chemical

mechanism" of the combustion process gained in these tests will assist engineers to grapple more effectively with the problem of developing better combustors.

In jet aircraft, he pointed out, it is necessary to burn a mixture of hydrocarbon vapor and air as completely and in as small a space as possible to get best performance at extreme speeds and altitudes.

And, "jets" are not the only devices to benefit from these tests. Scientists and engineers agree that the new flame data may well suggest ways of improving the design of a variety of equipment, ranging from engines for blast-furnace blowers to household heating systems.

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To All Corporate Members: *Proposed Amendment to the Constitution of the Western Society of Engineers*

In accordance with Article XV, Section 2, of the Constitution of the Western Society of Engineers, the following notice is printed, and herewith mailed.

The proposed Amendment to the Constitution of the Western Society of Engineers, as set forth below, has been submitted by 25 Corporate Members, in accordance with Article XV, Section 1.

Subsequently, the proposed Amendment was submitted to the Board of Direction and referred to the Amendments Committee, which latter body reported to the Board of Direction at its regular February meeting. The proposed Amendment was approved by the Board of Direction of the Western Society of Engineers, upon recommendation of the Amendments Committee.

Proposed Amendment

Article VII

Sec. 1. Fees and dues for the various grades of membership shall be stipulated in the By-Laws Article II—Section 2. From each of these annual dues \$2.50 shall be set aside as subscription to the publication of the Western Society of Engineers.

On transfer to a higher grade, the entrance fee previously credited to a member shall be applied against the entrance fee for the new grade.

Sec. 5. Corporate and Affiliate Members over sixty-five years of age shall not be billed for dues after having paid dues for thirty years, exclusive of dues paid as a Student Member. Such members shall be known as Life Members, but this designation shall not be construed to establish a separate grade of membership.

Meeting Call

This is to notify all Corporate Members that at the April 25, 1955 meeting of the Western Society of Engineers, at its headquarters, the above Amendment

shall be the order of business for discussion in accordance with Article XV, Section 2, of the Constitution of the Western Society of Engineers.

The Greeks Had a Metallurgist for It

While Vulcan is generally regarded as the god of the forge, actually he was the god of fire, but a recent research by F. L. LaQue of International Nickel Co. into mythology unearths the fact that ancient Greek civilization was largely credited to Hephaestus, who was a metallurgist.



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Technical Education

(Continued from Page 4)

means that over 75 per cent of our high school population has no contact with this subject.

When young people who ordinarily might be attracted to science and engineering college programs come to their higher education unprepared, they are diverted easily to other fields of study.

We are on the verge of unprecedented heavy enrollments at a time when we are faced with a dearth of mathematics and science teachers. Estimates of the number of college students completing high school teaching certificate requirements in science and mathematics last year reveal a substantial decline in comparison with 1953.

The percentages were: mathematics, down 11.35 per cent; general science, 9.56 per cent; biology, 5.42 per cent; chemistry, 8.16 per cent, and physics, 27.45 per cent.

Compared with 1950, the percentage declines were even more alarming, being placed at 50.6 per cent for mathematics, and more than 56 per cent for the other studies as a group.

A survey of the teacher situation, which was initiated jointly by the Engineering Manpower Commission of the Engineers Joint Council and the Scientific Manpower Commission, showed that only 53 per cent of those receiving teaching certificates actually entered the teaching profession. Many accept positions in business and industry, and a substantial number are claimed by the armed forces.

The task before us is to apply positive remedial action at the earliest possible moment. We must bring home to the American people that our future progress, our high standard of living, and, in fact, our very survival depend upon our technological competence, and that the elementary and secondary school teachers and curricula, as well as higher education, are the key to its maintenance.

Let us explore some of the procedures that might be used to relieve the manpower crisis that faces us:

HIGH SCHOOL CURRICULUM

Educators are discouraged by the fact that many high school students, when approaching graduation, decide that

they would like to pursue science or engineering in college but find, too late, that they do not have the prerequisite courses. Frequently, students remark that they were not aware, when entering high school, of the type of program they should have taken to prepare them for science or engineering in college.

In the interest of remedying this situation and, thereby, increasing the supply of scientists and engineers, a suggested high school program which

would give good preparation for college work in science or engineering is shown in Table I. Let me emphasize that this is a suggested program and should not be considered as a rigid requirement. Many variations could be suggested, such as the introduction of shop work, etc., but it is felt that the program presented would give a proper background for a student intending to be a professional man in science or engineering.

Some educators feel it is undesirable

Table 1
SUGGESTED HIGH SCHOOL CURRICULUM FOR STUDENTS INTENDING TO FOLLOW ENGINEERING AND SCIENCE PROGRAMS IN COLLEGE

FRESHMAN YEAR			
1st Semester		2nd Semester	
Subject	Unit	Subject	Unit
English	1/2	English	1/2
Algebra	1/2	Algebra	1/2
Foreign Language	1/2	Foreign Language	1/2
World History	1/2	World History	1/2
Art	1/4	Art	1/4
Physical Education	1/4	Physical Education	1/4
	2 1/2		2 1/2
SOPHOMORE YEAR			
1st Semester		2nd Semester	
Subject	Unit	Subject	Unit
English	1/2	English	1/2
Geometry	1/2	Geometry	1/2
Foreign Language	1/2	Foreign Language	1/2
Biology	1/2	Biology	1/2
Music	1/4	Music	1/4
Physical Education	1/4	Physical Education	1/4
	2 1/2		2 1/2
JUNIOR YEAR			
1st Semester		2nd Semester	
Subject	Unit	Subject	Unit
English	1/2	English	1/2
Advanced Algebra	1/2	Solid Geometry	1/2
Chemistry	1/2	Chemistry	1/2
U. S. History	1/2	U. S. History	1/2
Mechanical Drawing	1/4	Mechanical Drawing	1/4
Physical Education	1/4	Physical Education	1/4
	2 1/2		2 1/2
SENIOR YEAR			
1st Semester		2nd Semester	
Subject	Unit	Subject	Unit
English	1/2	English	1/2
Trigonometry	1/2	College Algebra	1/2
Civics	1/2	Civics or Social Studies	1/2
Physics	1/2	Physics	1/2
Physical Education	1/4	Physical Education	1/4
	2 1/4		2 1/4

to prescribe the high school program too closely. They refer to the investigations that indicate that there is only a remote relationship between good performance in engineering college and the pattern of high school subjects. A better indicator, it has been pointed out, is general quality of high school work.

However, for a student intending to pursue engineering in college it is considered desirable that at least nine units be prescribed: three in English, three in mathematics, two in science, and one in history, out of a total of fifteen. The four units of mathematics, shown in Table I, are very desirable, but it is believed that a requirement of this number, at this time, would exclude or discourage many potential engineering candidates, and thus adversely affect the supply of engineers.

HIGH SCHOOL MOTIVATION

With the high school curriculum established, it is then necessary to have students interested in pursuing it. This requires not only the early identification

of talent, but also a desire on the part of the student. The search for talent and interest should begin in the higher elementary grades, and not delayed until the student is ready to enter high school. At this point the teacher plays a vital role. It is difficult to instill enthusiasm in students with uninspired teaching.

The student must be convinced that science and mathematics are not unduly difficult, and that with reasonable ability and industriousness satisfactory performance will follow. The courses should be made as interesting as possible through demonstrations and repeated references to applications in everyday life of the principles being studied. Many students will exert effort if they believe what they are studying has a useful application. His appetite for further knowledge is whetted if he can see a direct relationship with familiar objects, such as airplanes, automobiles and toys.

A proper visual demonstration, with adequate classroom equipment, is a pow-

erful means of creating interest. Today, there are good educational aids, including films, available and these should be used. Interest is also promoted through student participation science projects. Education does not have to be dull and routine, but rather can be an interesting experience: although not necessarily easy, since learning is a self-process and will always require effort on the part of the student.

Stimulated teaching can occur best if the teacher is conversant with the latest developments in his field. There should be more regional summer institutes and conferences, sponsored by foundations and colleges, for high school teachers. At these meetings contact with eminent scientists is decidedly beneficial.


Industry can assist by having inspection trips of plants and laboratories for science teachers and students so they can observe applications of scientific principles. This will be beneficial for the teacher and students, as well as good public relations for the company. Indus-



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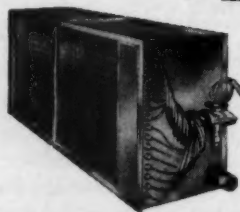
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try can also furnish speakers having a message of interest, offer summer employment to teachers, and help in evaluating course material.

The colleges and universities can be helpful by offering summer and evening refresher courses of interest to science teachers.

Of course, the basic responsibility for inspired teaching rests with the individual. He should strive continuously to keep up to date in his field. It may be interesting to learn of the number of science teachers who subscribe to, and read regularly, a scientific journal.

Effective promotion of interest in science, and improved science teaching, is being performed by The Future Scientists of America Foundation of the National Science Teachers Association, and by Science Service.

If students are informed of the opportunities in science and engineering many of them will become interested in careers in these fields. In addition to the teacher, and guidance counselors, one way of imparting this information is through a Career Conference. Such conferences, for high school students in the Chicago area, have been held annually since 1948 on the campus of the Illinois Institute of Technology.

The Conference is sponsored by the Chicago Sun-Times, the Chicago Technical Council and the Institute. Thousands of high school students have received occupational information from men and women actually engaged in each vocation and successful in their fields.

And, of course, once the student has decided to follow a science program in high school the objective is for him to graduate. Competent counselling is sometimes necessary. According to figures released by the U. S. Office of Education progress is being made in reducing the mortality rate. In 1945, 46.7 per cent of the students who entered high school finally graduated. In 1951, it increased to 62.5 per cent. In 1954, it exceeded 69 per cent.

SCIENCE TEACHERS

In addition to motivating the student toward pursuing science subjects in high school, more people must also be motivated to teach such subjects. The present need for new high school science teach-

ers is estimated by the National Education Association to be 7700 per year. The seriousness of the situation is indicated by the fact that the ranks are being filled at approximately only one-third of this rate.

The basic motivation to adopt a science teaching career should be the importance of the undertaking and the personal satisfactions and rewards derived therefrom. Of course, in order to attract new recruits to the field the salary should be adequate. Because of the critical situation that exists special efforts should be made in this regard.

Unless teachers receive professional level salaries the better members of the profession will not be retained. Qualified people will not be attracted to teaching and the classrooms will be infiltrated with less accomplished instructors.

We should profit by the lessons learned during World War II where educational plants were allowed to deteriorate, and the inadequate treatment of teachers lost many of them to other pursuits. Such catastrophes must not be

permitted to occur again. A teacher is a valuable investment. He should be appreciated to the extent that he will feel that he is sufficiently rewarded to remain in his chosen field.

For the nation as a whole the average salary for teachers is below that of the total employed population. This is a discouraging situation in view of the significant influence of unskilled workers on the national average. Teaching should be treated as a profession in all respects; not only in requirements for admission and advancement, but also in the matters of remuneration. A third of our states do not have a legal minimum salary for teachers, and even in some of those that do it is inadequate.

Lack of proper appreciation is a serious deterrent to full productivity and creativeness in any profession. It is particularly aggravative in the teaching field, however, where social restraints are prevalent in addition. The teacher is expected to adhere to a standard of conduct possessed by few other citizens. Unless we begin treating the members of



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the teaching profession as normal people with normal desires, including adequate compensation for universally noteworthy performance in a difficult occupation, the high standards of the profession will be in jeopardy, and it will be difficult to obtain competent newcomers to the profession.

And, after great effort is expended on procuring and retaining effective high school science teachers, and considering the effect such teachers have on the supply of engineers by influencing students toward such endeavors, and thereby affecting our national security, it does not seem wise policy to remove them from this important work by the draft.

COLLEGE MOTIVATION

Unless the high school graduate ultimately completes his college work it is unlikely that he will become a scientist, engineer or teacher. If the shortage of such categories is to be alleviated, therefore, the gap from high school to college must be bridged. Over the years the function of the high school has changed from emphasis on a college preparatory program to a terminal program. Seventy-five years ago about 70 per cent of all high school graduates completed college. Now, only about 20 per cent do so.

From an ability standpoint the top 25 per cent of high school graduates should go to college. Yet only one-half of this group does so. This is the area that should be cultivated to procure additions to the ranks of engineers and scientists.

Some students just aren't interested in going to college. The thought never occurs to them. Usually in many such cases family background has been of a non-college-type and parental attitudes are not encouraging. Such students should be counselled on the advantages of a college education.

The high school student should give consideration to attending college before he approaches graduation. He can obtain great assistance in such motivation by participating in a proper guidance program. One of the most striking examples of the benefits of such a program was the work done by Rothney and Roens. They started with two groups, A and B, of high school students equal in intelligence test scores and several other variables. Over a period of sev-

eral years. Group A was given educational guidance and Group B was left alone. The results showed that 27 per cent of Group A made honor grades compared with only 10 per cent of Group B. Further, 53 per cent of Group A entered college contrasted with only 36 per cent of Group B. Thus, in this instance, guidance had a pronounced effect on motivation.

A major reason for not attending college is lack of adequate financial resources. Much is being done to correct this, particularly through scholarships, loan funds, and part-time employment while in college. The pattern of attendance between public and private institutions of higher learning gives indication that the cost of education is an important factor to a student.

The tax-supported institutions, with their lower tuitions, are attracting an increasing proportion of the college student body. Enrollment statistics from the U. S. Office of Education reveal that in the fall of 1952 the tax-supported in-

stitutions enrolled 7.5 per cent more students than the private colleges and universities. In 1953 this figure doubled, amounting to 15 per cent. In 1954 it went to 27 per cent, almost doubling again.

This pattern, projected into the future, indicates that a large majority of students will be receiving their education in tax-supported institutions. In some academic circles this disturbance in the distribution between our dual educational system is viewed with apprehension. There is fear that an inordinate continuation of the trend will invite control that would interfere with the educational process. At present our state institutions do an excellent job, and it is felt that the best assurance of continuance is the balancing effect of strong, "free enterprise," private institutions with comparable enrollments.

In order to approach this, and at the same time accomplish the basic objective of rendering financial assistance to worthy students, more scholarships

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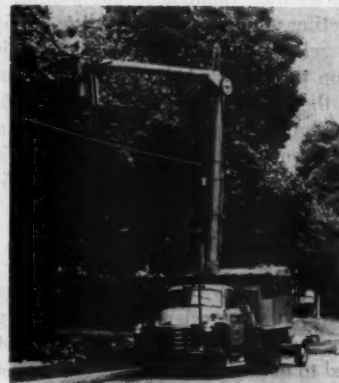
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would be desirable. It suggested, however, that they be financed by industry and the state, and not by the federal government. Federally-sponsored veterans' aid educational programs have been satisfactory, but outright federal subsidy of scholarships, with its attendant possibility of interference, is not desirable.

By means of the scholarship the needs of particular fields may be accommodated and, thus, gaps in certain areas may be filled. It is unwise to restrict the wording of scholarships too much, however, as experience shows that they may go unused and, thereby, contribute nothing to relieving the critical manpower situation.

Restricted scholarships also run the risk of attracting misfits into selected fields. They are criticized, too, on the basis of robbing other fields of competent students. Some observers feel that the law of supply and demand in the manpower market should not be disturbed through devices such as schol-

arships. In time of crisis, however, such as the present, the time-consuming feature of natural forces is too great and the intelligent use of scholarships would be beneficial.

HIGHER EDUCATION

Naturally, higher education should also participate in improving the manpower situation. Technological educational institutions carry a heavy responsibility for developing our stockpile of scientific and engineering manpower. They should not only teach, but should encourage an increase in the supply by attracting students. They should also maintain communication with high schools and junior colleges so as to facilitate proper articulation of scholastic programs.

In cooperation with industry, they can sponsor meetings and seminars for secondary school science and mathematics teachers to point out the importance of technological education to the American economy. Thus, these teach-

ers will be better equipped to recognize and encourage engineering talent among their students.

Colleges are obligated to strive to admit only qualified students, orient them into proper fields of study, and retain as many as possible by helping them to render satisfactory scholastic performance. This requires adequate admissions procedures, embodying intelligence and aptitude tests, and proper student Counseling.

Colleges can also conduct evening programs, and in-plant extension programs to up-grade employees who do not have the opportunity to attend day classes. Also, the Engineering, Science, Management, War Training (ESMWT) type of program can be revived if necessary.

At the higher level of education, also, close attention to the qualifications of the technical teaching staff is vital, for ineffective ones may be responsible for many students failing in, or abandoning, their course of study. Such teachers obviously are no asset in attracting new students.

To attract qualified students, the university or college must acquire prestige as an educational institution, a prime requisite for which is a faculty whose members are competent in their respective fields. It is important that they possess the qualities of sympathetic understanding of the students' problems; of sincere interest in their charges' intellectual growth; of the kind of leadership which imparts inspiration.

The educational institution is a community of scholars and requires outstanding teachers to attract outstanding students. Improvement and development of curricula, and the building up of adequate facilities, also call for the services of a competent faculty. And such a faculty can be had only if the college administration gives thorough and careful attention to the selection, training, and advancement of its teaching personnel.

To retain a competent faculty, however, a suitable university atmosphere must prevail. Evidences of anti-intellectualism, and suspicion of scientists, do not contribute to the type of environment where creative work can be conducted with appreciation. The college professor resents being singled out as the subject of special investigations and loyalty tests. The academic profession

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DEFERMENTS

Once the student is in college and doing satisfactory work every effort should be made for him to complete his program. Generally, college students with satisfactory scholastic records are deferred until they finish their undergraduate studies. In contrast, graduate education is having difficulty in retaining students because of local draft board deferment policies in some parts of the country. The recent Selective Service Regulation Amendment, pertaining to deferment for graduate study, changing class standing from the top half to top quarter and qualification test score from 70 to 75 aggravates the situation still further.

It is disturbing when students who have the ability and desire to pursue advanced study are prevented from doing so. This is serious because the real contributions toward fundamental research are made in the graduate field. The best candidates for future scientific and engineering leadership must have graduate training.

Because many graduate students are being drafted, in numerous instances their places in the nation's colleges are being filled by foreign students. This has the ironical effect of our training scientists for foreign countries instead of for our own benefit. We have had recent evidence of this where a group of foreign students, trained in this country, now wish to return to Red China. They sat in the classroom chairs that should have been occupied by American boys who were drafted. There is need for reappraisal of our draft policies.

Selective Service deferments should not be regarded as granting privileges to a few, but rather as a means of enhancing the security of the majority. Actually, engineers and scientists constitute less than one-half of one per cent of our population. Yet, we are relying on this limited group to further the advance of our living standards, to create

our military equipment, and, in general, be responsible for our national security. They must complete their training if they are to continue in this role.

Completion of his education will enable the student to make more worthwhile contributions in whatever activity he later becomes engaged. But the student should receive no special privileges. Therefore, while it is considered important that his training not be interrupted, once it is accomplished, in time of military preparedness, he should be used wherever his services would do most in the interest of national security. This may be as a member of the armed forces, in industry, or elsewhere. In other words, he should not necessarily be excused from military service, but rather deferred during a period of training which will ultimately make him a more valuable soldier or scientist.

If he does go into the armed forces it is assumed he will be used as effectively as possible. It is very discouraging to hear of PhD's in military service peeling potatoes.

UTILIZATION

Educators always like to see their product used effectively. Now, in this critical period, it is doubly important that this be done. Therefore, employers should make every effort to use intelligent recruitment practices. No one should be guilty of compounding a shortage with wastage.

With few exceptions the company representatives visiting the campus have done an excellent job in hiring graduates. As a suggestion, however, in the interest of proper placement it may be desirable to have an engineer in the recruitment party as many of the students want to know engineering details regarding a future job. Sometimes personnel men, and understandingly so, are not able to furnish this kind of information readily.

Since engineering curricula are becoming more fundamental there is a diminishing distinction between the various engineering disciplines. Consequently, in the interest of alleviating the

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shortage, companies may wish to consider putting less emphasis on a particular type of engineer. And, of course, more consideration should be given to the use of women engineers.

And a further suggestion, since a competent faculty is difficult to assemble it would be helpful if the hiring were confined to the students. The 1951 Bureau of Labor Statistics study shows that for all engineers 75 per cent are employed by private industry, 22 per cent by government, and only 3 per cent by education. Since education represents such a small proportion we would like to retain the few we have, especially in view of the expected increase in enrollments.

Also, serious consideration should be given to the use of technical institute graduates as engineering aides, and relieve engineers of many of the details they now handle. Effective operation would indicate the need in industry of several technical institute graduates for every professionally trained engineer. So far, in numbers of graduates, the ratio is reversed, so more effort should

be devoted to the technical institute program.

TECHNICAL SOCIETIES

The technical societies also have a responsibility in the manpower situation. As they are doing, they should participate in conferences such as this one, and disseminate information regarding manpower in the respective professions. Through their affiliation with Engineers Joint Council the societies are properly associated with the good work being done by the Engineering Manpower Commission and the Scientific Manpower Commission.

It is fitting that the professional societies be involved in such activities. It is another way the societies can be of service to their membership. Many of the foregoing items discussed in this paper pertaining principally to areas of cooperation for education, apply equally well to the professional societies.

So as to attract young people to the engineering profession the societies should be ever vigilant to enhance its status.

The concerted efforts of the societies to unify the profession at an early date would be beneficial.

Naturally, the societies should be concerned with the education of the aspirants for membership. In most cases the extent of the engineering program has remained unchanged over many years, while other professions have found it necessary to expand the period of formal education. If engineering wishes to retain and enhance its status as a profession, the preparatory period must keep abreast of technological advances. The bachelor's degree has uniformly been considered as the badge of entrance into the profession, but at some point the requirements must be raised if the newcomer is to make a contribution in a field becoming increasingly complex. The curriculum has undergone occasional adjustments within framework that has remained fixed for many years. Possibly an extension of dimensions is in order.

Has the engineering profession, like the sciences, now reached the state where a graduate degree represents the proper minimum preparation? It would appear that the time for consideration of this is at hand if the student is to possess the proper background in the fundamental areas, and also acquire to some degree the specialization needed to advance the practice of engineering. This is not a matter of concern only to educational institutions. The engineering societies also must take a leading part.

Finally, it would seem that the professional societies could be effective in promoting the establishment of a permanent body with the responsibility for maintaining current information on the nation's scientific and technological manpower situation. We know a great deal about the supply of our natural resources but less, in an organized manner, about our human resources. Since the latter are much more important it would be logical that we should have accurate, up-to-date knowledge of them.

When the present critical manpower situation became apparent some excellent organizations took action and are doing very commendable alleviating work. If this could be kept on a permanent basis the emergencies could be foreseen and orderly, remedial, measures undertaken at the proper time.

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C-2600 CHIEF ENG. Standards Mgr. ME Age: 35-48 5 plus yrs. exp. with good background in manuf. & engrg. standards work. Duties: supv. setting up standards for engrg. procedures manuals, drafting standards, standards for finishes, tool requirements and Minimum & maximum performance standards, cost reduction work. For mfr. of instruments. Sal: \$10,000-\$12,000. Loc: Michigan. Employer will pay the fee.

C-2602(a) GEN'L MGR. Age: 40-50. 5 plus yrs. exp. previous exp. must include overall administrative & sales duties of a stamping plt. producing on mass volume low cost basis as would be reqd.

in automotive industry. Duties: managing a plant & business engaged in mfr. gears & stampings. Some job hop runs as well as mass production. Sal: \$10,000 to \$12,000. Location: Chicago. Employer might negotiate fee.

C-2602(b) CH. TOOL ENGR. Age: 40-50. 5 plus yrs. as chief inspector or asst. in tool, gear, or stamping shop working to close tolerances. Duties: supervising designs, processing, & manufacturing tools for close tolerances stamping & gear cutting. For Mfr. of stamping. Sal: \$600-\$750/mo. Location: Chicago. Empl. might neg. fee.

C-2610 GENERAL MGR. Age: 45-55. 5 plus yrs. exp. in heavy management work, ability to make decisions in steel plate fabrications and wooden boat building or repairing. Duties: managing well known company, engineering, building and repairing marine equipment. For an engr. & builder of boats. Sal: \$10,000 to \$12,000. Empl. will negotiate fee. Location: Chicago.

C-2616 ASST. PLANT ENGR., IE Chem. Eng. ME or CE Age: up to 40. 4 plus yrs. exp. in plant engrg. food, pharmaceutical or chemical processing plts. Knowledge of processing equipment. Duties: serve as staff consultant on design and layout of plts. and mechanical eqpt., machinery and parts. For a manufacturer of liquid foods. Sal: \$6000-\$8000 per yr. Considerable traveling. Loc: New York.

C-2631(a) PRODUCTION CONTROL MGR. Age: up to 35. 3 plus yrs. exp. in supervising methods, processing, tooling manufacturing or production control. Knowledge of small parts mass production. Duties: managing production control functions such as planning, scheduling, machine loading and manpower requirements. For mfr. of electronic tubes. Sal: \$6000-\$9000 per yr. Location: California.

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101 MW CHIEF ENGINEER 36 MBA ME 7 mos. design pneumatic & hydraulic control systems. 7 yrs. liaison engineer for laboratory director. \$8000 U.S.

103 MW OFF. ENGR. 37 CE 3 yrs. design & computations of reinforced concrete for superhighway bridges, and petroleum refineries. 9 mos. detail drawings of structural steel for commercial buildings. 15 mos. surveys of pipeline. \$6200 Midwest.

104 MW METALLURGIST 21—4 mos. spectrophotometer to determine composition of zinc & aluminum die castings & warn of contamination. Chgo. \$4100.

105 MW GEN. MGR. 55—20 yrs. designing, installing & supervising those products, processes controls, procedures, systems & methods needed in sales, administration, engineering and production. \$18,000 U.S.

106 MW FACTORY MGR. 39 ME 7½ yrs. resp. for production, maintenance, labor relations, and cost reduction. 1½ yrs. design & development of watertreatment lab. 5½ yrs. design & procured spec. jigs, fixtures, specified st'd., tools & gages. \$900/mo. U.S.

107 MW CHIEF ENGR. 28 CE 10 mos. resp. for engrg. dept. of steel & iron works. 9 mos. draw plans for grading layouts of gas meter sites. 3 yrs. design & drawings of grades, drainage, right-of-way and layouts of plans of roadways for superhighways. \$5900 West.

108 MW FACTORY MGR. 52 ME 27 yrs. charge of personnel plant maintenance, piece work rates, production, purchasing, accounting, public relations, estimating, and engrg. \$9000 Midwest.

Unionism vs. Professionalism

Letters

Mr. Forrest's Article . . .

Dear Editor:

. . . T. Carr Forrest, Jr., president of the National Society of Professional Engineers, in an article in the *American Engineer*, March, 1954, under caption of "Professionalism or Unionism," which was reprinted in the *Midwest Engineer*, Vol. 6, No. 12, May, 1954, said:

The idea of unions for engineers is not a new one. Union activities for professional employees can be traced to the period immediately following World War I when the American Association of Engineers organized and directed a collective bargaining campaign for professional engineers before the U. S. Railway Wage Board in the interest of technical employees of the railroads. That the issue of professionalism vs. unionism is also not new is illustrated by the statement of AAE that ". . . our action stirred up animosity: brought on us the suspicion of employers that we were a 'glorified' labor union . . ." And it is also interesting to note the parallel of 1919 to today; ". . . the entire campaign conformed to the highest principles of professional conduct." So it is seen that the idea of the "professional" union also is not particularly new.

By the very act of writing a broad dissertation on "Professionalism or Unionism" Mr. Forrest assumes the role of an authority on the subject. He must, then, know the basic qualities which mark a union and its characteristic methods and activities. He must, for instance, know that

(1) a union is composed of employees, affiliated for the sole purpose of "bargaining" with employers—that it is never an association of employers and employees working together for improvement of the economic status of all members of the profession to which both employers and employees belong, and that

(2) unions are formed to create pressures which make the employees, theoretically at least, as strong in bargaining as their employers, and that the use of "pressure" is their distinctive characteristic.

If Mr. Forrest had bothered to go back to original news stories, to primary sources, such as *Engineering News-Record*, during the period of 1918-1920, he would have recognized the absurdity of his statement that A. A. E. activities in behalf of railway technical employees during that period were the beginning of "unionism." He would have learned that—

(1) American Association of Engineers was not a "union" but an inclusive association of engineers, employers and employees: and that

(2) Employee engineers were represented in the campaign by outstanding consulting and executive engineers, many of them top executives of the railways involved;* and also that

(3) The hearings were initiated by the U. S. Railway Wage Board which

* Edmund T. Perkins, Isham Randolph, and Francis R. Weller were spokesmen in the first hearing before the Railway Wage Board, all prominent consultants. W. H. Finley, then president of the C. & N. W. Railroad Co., Willard Beahan, First Assistant Engineer of the New York Central Railroad, and W. W. K. Sparrow, Chief Engineer of the C. M. St. P. & P. Railroad, carried the fight to the regional boards when the U. S. Railway Wage Board decentralized the hearings.

invited the unorganized technical employees to lay their complaints before that agency; that American Association of Engineers did not organize the engineers and initiate the campaign; it offered its services to the unorganized technical men solely as their representative; and, finally that

(4) At no stage in the hearings did the employees or the Association threaten, or even suggest retaliation if the pleas of the technical men were denied.

Throughout the campaign American Association of Engineers relied unservedly on the basic fair mindedness of the employers of engineers and of the public which would eventually pay the bill for increases in the salaries of railway technical men. The appeal was wholly factual, not emotional. The Association showed that the technical men had received no advance in compensation during a period when living costs had increased 63 per cent. They showed also that, despite the time and money spent on engineering training, engineers were actually, in some cases, receiving less than the non-professional employees whose work they supervised or directed, and in general received salaries too low to compensate them for the services they rendered and for their investment in training, in comparison with non-

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*This is reprinted from the Oct., 1954 issue of The American Engineer.

technical employee wages. They cited figures to prove that technically trained men were leaving the service of the railways and that the railways were facing a shortage of technically trained workers because of the inequities apparent in salary schedules . . .

Mr. Forrest's quotation that A. A. E.'s action for railway technical men "brought on us the suspicion of employers that we were a 'glorified labor union'" is deliberately misleading quoted out of context, because it leaves the impression that the suspicion was justified. His statement that "It is also interesting to note the parallel of 1919 to today: 'the entire campaign conformed to the highest principles of professional conduct,'" is innuendo quite unworthy of the officer of one engineering society speaking of another reputable organization of engineers. There is no parallel between the action of A. A. E. in 1918-1919-1920 and that of the unions of professional engineers today, restricted to employees, banded together to exert economic pressure and

if necessary resort to coercive measures in order to win their demands . . .

It is doubtful that Mr. Forrest has not heard of the valiant work that A. A. E. did between 1937 and 1947 to clarify the status of professional employees under the Wagner Act and bring about revision which would protect engineers from involuntary inclusion in heterogeneous labor unions. It was A. A. E. which in 1937-1938-1939 sounded the alarm to show that engineers were subject to such inclusion and that they were actually against their will being forced to accept labor union representation. During this period other societies contented themselves with adjuring engineers not to sacrifice professionalism by joining unions, overlooking the provisions of the Wagner Act which made them captives of unions chosen to represent units described by the National Labor Relations Board as "appropriate" in which engineers were involuntarily included. Because of the informative articles which A. A. E. published in "Professional Engineer," based on a

systematic study of weekly reports of the National Labor Relations Board, it was swamped by appeals from beleaguered engineers all over the country. To help these men, and at a great cost in money and time, A. A. E. brought out in 1944 a handbook, called "Technologists' Stake in the Wagner Act," which revealed to engineers their exact status in the Act, and the most practical methods of defending their independence—their *real* freedom of association." This was the only authoritative study of the impact of the Act on professional employees available to engineers subject to the Act until the Taft-Hartley Act was passed, and it was an important factor in the constructive changes made by the Taft-Hartley Act . . .

We feel that not only has a great injustice been done the American Association of Engineers, but a greater injustice to many of the profession's outstanding engineers who gave generously of their time to make possible the Association's excellent record of accomplishments in the field of "human engineering" over

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the past forty years. We ask that your society extend us the professional courtesy of a public retraction by the publication of this letter in the *American Engineer*. In the spirit of fair play, I do so request.

H. A. WAGNER, Past President,
American Association of
Engineers
Chicago, Ill.

Editor's Note: Mr. Wagner's letter was referred to Mr. T. Carr Forrest, Jr., for comment, and he replied as follows: "The basis for my comments in the article referred to by Mr. Wagner appeared in the Prologue of the 1944 publication of the American Association of Engineers titled 'Technologists' Stake in the Wagner Act.' The portion referred to is as follows:

"Twenty-five years ago American Association of Engineers organized and directed the first major collective bargaining campaign for professional engineers. We appeared before the U. S.

Railway Wage Board to seek well deserved pay increases for technical employees of the railroads. We were successful. We resorted to no coercive tactics; the entire campaign conformed to the highest principle of professional conduct. Nevertheless, our action stirred up animosity; brought on us the suspicion of employers that we were a 'glorified' labor union; caused other technological societies to cooperate in a campaign to 'stop A. A. E.' Most disillusioning of all was the ingratitude of some 6,000 railroad workers who had joined to participate in collective bargaining, and who, as soon as they had won their increases in pay, withdrew their support from the Association.

"This Association is not a novice in collective bargaining, therefore. Nor are we, though disillusioned, discouraged. Never have we abandoned our conviction that the economic status of engineers can and *should be* improved by collective bargaining."

Argonne Lab. Wins Fire Award

The National Fire Protection Association has announced that Argonne National Laboratory, Lemont, Illinois, has been awarded the Grand Award (First Place Award) in the Industrial Division of the 1954 Fire Prevention Week contest.

A total of 1,668 entries were submitted in the contest of which 84 were in the Industrial Division contest in which the laboratory participated.

The purpose of the annual contest is to stimulate universal fire safety consciousness and to encourage the observance of Fire Prevention Week as a "springboard" for year-around fire prevention programs. The contest is sponsored annually by the National Fire Protection Association of Boston, a nonprofit educational and engineering organization devoted to improving the protection of life and property from fire. The association's membership is drawn principally from United States and Canadian business and industry, fire departments, and governmental officials throughout North America.

The laboratory's 1954 entry which described the year-around fire prevention and fire protection program of the laboratory was prepared by the Fire Protection Department under the direction of Fred O. Pancner, fire protection engineer. The laboratory's fire protection, safety, and health program is under the direction of Assistant Laboratory Director John T. Bobbitt.

The laboratory has entered the contest annually since 1950. In 1950, the laboratory's entry received tenth place in the Industrial Division and in the 1951 and the 1952 contests, the laboratory received second place awards. In the 1953 contest the laboratory was fourth.

Fire Prevention Week started as Fire Prevention Day, and was first observed throughout the United States on October 9, 1911. In 1920, President Woodrow Wilson issued the first national Fire Prevention Day proclamation, but it was not until 1922 that the whole week was officially proclaimed Fire Prevention Week. Traditionally, therefore, Fire Prevention Week is observed each year during that calendar week which includes October 9, the anniversary date of the Great Chicago Fire.

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Applications

In accordance with the By-Laws of the Western Society of Engineers, the following names of applicants are being submitted to the Admissions committee for examination as to their qualifications for admission to membership into the Society in the various grades, i.e., Student, Associate, Member, Affiliate, etc. All applicants must meet the highest standards of character and professionalism in order to qualify for admissions, and each member of the Society should be alert to his responsibility to assist the Admissions committee in establishing that these standards are met. Any member of the Society, therefore, who has information relative to the qualifications or fitness of any of the applicants listed

below, should inform the Secretary's office. The Secretary's office is located at 84 East Randolph Street. The telephone number is RAndolph 6-1736.

- 131-54 Frederick H. Bird, Combustion Engineer, Truax-Traer Coal Co., 230 N. Michigan Av.
- 132-54 Hubert J. Velten, President, Askania Regulator Co., 240 E. Ontario St.
- 133-54 Richard V. Brouillette, Property Accounting Engr., The Peoples Gas Light & Coke Co., 122 S. Michigan Av.
- 134-54 Eugene W. Deinert, Property Accounting Engr., The Peoples Gas Light & Coke Co., 122 S. Michigan Av.

- 135-54 William G. Fulton, Engineer, Illinois Bell Telephone Co., 208 W. Washington St.
- 136-54 Willard E. Collins, Assistant Chief Engr., Acme Steel Co., Riverdale, Ill.
- 137-54 P. Arthur Green, Secretary and Sales Engr., Robt. W. Hoffman Company, Inc.
- 138-54 T. W. Wigton, Assist. Gen'l Supt., Comm. Dept., Chicago, Burlington & Quincy Railroad Co., 547 W. Jackson Blvd.
- 139-54 Melvin L. Polacek (Trsf.), Resident Engr.-Bridge Constr., Bureau of Engineering, City of Chicago, City Hall.

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Color Service To Eliminate Error

A new service that eliminates human error from specifications of colors for industry and the government has been established at Armour Research Foundation of Illinois Institute of Technology, Chicago.

The color service was set up on a test basis to aid industrial concerns that manufacture colored products. The service also could assist government work concerned with standardizing colors in such applications as uniforms or camouflage.

The service was made available through the acquisition of a \$17,000 General Electric recording spectrophotometer, an instrument that standardizes colors by reducing them to curves on a graph.

The spectrophotometer offers a method of standardizing and checking color standards and controlling the color of dyes, glass, inks, and textiles, according to O. Harry Olson, Foundation research physicist in charge of the color service.

"A standard may vary due to aging or contamination. The color curve, however, is a permanent record of any color in terms of physical units and will reveal any variation.

"This can not be done visually because sky-blue, aqua, orange, and other colors mean different things to persons who have had different experiences."

But by comparing the spectrophotometric curves for a product with the curve of a standard, it often is possible to determine what is needed for a better match, Olson explained.

The instrument, capable of accurately measuring either transmittance or reflectance, provides a system for specifying tolerances in a colored product, he added.

If the curves are different, the product and standard may appear the same under certain types of light and different under others. Only if the curves are almost identical will the two appear the same under any illuminant, he said.

This is important, for instance, in the manufacture of kitchen appliances. It is necessary that a refrigerator match the color of a stove even when used in kitchens that have different kinds of lighting, Olson said.

A booklet, "Color and Spectrophotom-

etry," was made available in February by the optics section at Armour Research Foundation to explain in detail the uses of the Foundation's spectrophotometer.

Copies may be obtained free by writing the Optics Section, Armour Research Foundation of Illinois Institute of Technology, 10 W. 35th St., Chicago 16.

1955 To Be Big Year For New Products

Expect a bumper crop of new products in 1955 resulting from industrial research, according to Dr. Charles N. Kimball, president, Midwest Research Institute, non-profit organization of 200 scientists in 18 different fields, Kansas City, Mo.

"Out of the more than \$3,000,000,000 spent in industrial research last year, there will be hundreds of significant and important new products and new industrial processes introduced this year," Dr. Kimball predicted. "And the number will increase in subsequent years."

Other present business trends spurred by research, reported by Dr. Kimball, were reduction of operating expenses and a "general movement of industries to markets rather than sources of raw materials."

Originally founded in 1945 to cover the six state area of Missouri, Kansas, Arkansas, Iowa, Nebraska and Oklahoma, Midwest is rapidly expanding research work handled for eastern firms and associations, particularly in New York, New Jersey, Pennsylvania and Maryland. For the past 5 years, industrial research handled by the Institute has increased 25 per cent each year. Today nearly half of its work comes from outside the original six state area. In the Spring, the Institute will move into a new \$1,500,000 building.

Dr. Kimball declared there was a growing movement of "science based" industry to the area served by Midwest. He pointed out that the great natural resource in the midwest, as it is anywhere, is its people. Fifteen years ago science graduates of midwestern univer-

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sities had to leave the area to obtain jobs. Now, although 25 per cent of its staff comes from areas other than the midwest, the Institute is helping to provide technical positions for the midwestern graduate both in its own organization and through its assistance to the development of "science-based" industry in the area. Dr. Kimball feels strongly about the importance of increasing this growth.

"We are in an important technical service organization to the midwest and to industry generally," he says, "and one of our most important jobs is to help in making the American businessman increasingly aware of the growing importance of the mid-continent area in the scientific, cultural and industrial scene of America."

Nearly One in Two

Americans probably carry more insurance than any other people, with life insurance policy holders numbering more than 90 million, according to the Chamber of Commerce of the United States.

New Fellowships Announced at Stevens

Dr. Jess H. Davis, president of Stevens Institute of Technology, announced recently the establishment of the Robert Crooks Stanley Fellowships in engineering and science at the Hoboken, N. J., college. The fund to support the fellowships is a gift of the family of the late Robert Crooks Stanley, a Stevens graduate of the class of 1899 and chairman of the engineering school's board of trustees from 1935 to 1948. At the time of his death, on Feb. 12, 1951, Stanley was chairman of the board of International Nickel Co.

The fellowships, Dr. Davis stated, will be awarded to full-time graduate students working for their master's or doctor's degree. The fund, which will eventually total \$250,000, and the awards will be administered by a committee consisting of one faculty member, two trustees, one alumnus and three members-at-large, Dr. Davis said.

The Stevens president hailed the estab-

lishment of the fellowships as an important contribution to graduate education in engineering and science.

"With these fellowships," he said, "we shall be able to attract to our graduate program a number of highly qualified students who not only will benefit personally but who will, as a result of their advanced study, be able to contribute to the nation's progress. It is particularly fitting that these fellowships should memorialize Robert Crooks Stanley, who was . . . recognized as an enlightened business executive whose appreciation of the value to industry of graduate engineering study and research was fully reflected in his many contributions to higher education during his distinguished career."

Prefab Structures Are Growing in Use

Prefabricated structures will become more widespread in the next few years—provided certain needed improvements are made to make them more popular.

That is the belief of Raymond W. Sauer, supervisor of the structural analysis section in the propulsion and structural research department at Armour Research Foundation of Illinois Institute of Technology, Chicago.

"This not only will involve structural advances, such as making flexible floor plans available, but also improving such interior features as wall finishes."

If a family buys a prefabricated home today, it gets the choice of a minimum of rigid floor plans. Sauer said interior components must be made flexible, so that families may have some latitude in laying out their homes.

"The public," Sauer commented, "has become very conscious of, and eager for, new structural materials."

He predicted that plastics will be used in making main members, such as walls, for homes, but warned there still are details to be worked out in their use, such as the problems of making structural connections.

Sauer stated that new uses for brick also will be found now that building experts have discovered reinforced brick masonry is versatile in its applications and can be used in many instances where it was previously necessary to use concrete.

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On Training — Letters from Leaders

In the last issue of *Midwest Engineer* we published another of about thirty letters received from leaders of Chicago-area firms concerning shortcomings noted in the engineers in their employ. Many of the letters also suggested what the engineers should do to correct their deficiencies.

Significantly, the engineer's technical training is generally considered adequate. In the broad area of Human Relations, however, engineers seem often to be "under achievers," according to the viewpoint of the industrial leaders as reflected in their letters.

We are printing another of these letters in this issue, as we shall do in future issues. Although the letters may be of greatest value to the younger engineers, we hope that all of the engineers who read them will benefit.

Here, then, is the next letter:

Dear Mr. Becker:

Your letter of August 31, 1951, to

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Mr. President of our Company, requests our opinions on the qualifications which equip engineers for supervisory and executive positions in industry. We are pleased to discuss this subject from an overall viewpoint of our Company's operations.

Over three-fourths of the college graduates in are technically educated persons, the leading fields being chemistry, chemical engineering, and mechanical engineering. The importance of engineering experience and training can be recognized by the fact that many administrative posts in our Company are occupied by technical people.

Some time ago, we canvassed several executives of and other organizations to obtain their expert opinions on factors which make men successful in industry. The resulting statements led us to conclude that the following qualifications are important to executive success:

- (1) The "will-to-do"—drive, enthusiasm, motivation;
- (2) Effective intelligence;
- (3) Effective relations with people;
- (4) Leadership—ability to evoke cooperative response from others;
- (5) Language facility—ability to express ideas clearly and fluently.

The extent to which these broad characteristics may be developed by a person is not well known and would have to be explored through exhaustive research. As can be readily recognized, some of these factors are conditioned within a person quite early in life, and although changes might be effected, depending on the willingness and desire of the person, it is obvious that effective training techniques and methods in these areas are lacking.

These qualities, of course, are listed without regard to any particular background of education. The fact that engineering has proven to be a good background for many of our administrative posts may be attributed to the technical nature of our business rather than to any belief that engineers are more apt to possess executive qualities.

The trend in engineering education today seems to place more emphasis on the development of well-rounded engineers with a true professional concept as opposed to emphasizing specialized skills. It cannot be concluded that the products of today's educational methods,

with more broadening courses and better fundamental technology, will be more able to assume executive responsibilities, because inherent abilities play such an important role. To design methods of equipping experienced engineers for administrative positions is even more difficult.

We hope these comments are of interest to you. The subject is so involved that it is difficult to discuss it fully by letter.

Sincerely yours,
(Signed)

Creative Process Techniques Needed

Today more than ever before, modern industry needs to develop creative process techniques the help them discover greater methods of economy in production and design. They cannot afford to remain stagnant.

The Pennsylvania State University will offer a one-week course June 27 to July 2 on the main campus in State College, Pa., to promote these procedures and principles which can assist in the production of new and fruitful ideas.

Some of the creative engineering topics to be covered are techniques, business machines, product design, imaginativeness, growth in industry, mechanical devices in a chemical plant, and training in a creative engineering program.

The program is geared to stimulate ideas in many applications of engineering. Persons in development, research, promotion, production, manufacturing and design will be inspired by creative engineering experts and have an opportunity to practice under their guidance in workshop sessions.

Speakers will include Alexander C. Wall, American Machine & Foundry Co.; Ralph D. Webb, Carbide & Carbon Chemical Co.; James H. Carpenter, Carrier Corp.; W. G. Soley, Carborundum Co.; C. F. Hix, Jr., General Electric Co.; B. O. Austin, Westinghouse Electric Corp.; and H. W. Nordyke, International Business Machines Corp.

The course will be conducted by the College of Engineering and Architecture at Penn State.

More information may be received from General Extension, The Pennsylvania State University, University Park, Pa.

Reviews of Technical Books



Indeterminate Structures

Analysis of Statically Indeterminate Structures, by John I. Parcel and Robert B. B. Moorman, John Wiley & Sons, Inc., New York. 1955. 571 pages. Price \$9.50.

This is the latest of what seems to be a rash of publications on Indeterminate Structures in the last few years. It is unquestionably the most complete American textbook in the field. The text is so designed that it may be used for several undergraduate courses, possibly for two graduate courses, and as a reference text for the practicing engineer.

The basic theory of deflections and statically indeterminate stresses is given a more complete and detailed treatment than would be found in other American texts. There are thorough chapters on deflection by work and special methods, the general theory of indeterminate stresses, work methods, column analogy, slope deflection, moment distribution, continuous girders and trusses, and rigid frames. In addition to these, there are excellent chapters on secondary stresses, the elastic arch and suspension bridges.

The instructor should be particularly pleased with the inclusion of a good supply of problems in the textbook. The reader will find a number of completely worked out illustrative problems. As far as possible these examples are carried out in a manner similar to design office procedure.

B.A.W., W.S.E.

Agricultural Drainage

Engineering for Agricultural Drainage by Harry Burgess Roe and Quincy Claud Ayres, McGraw-Hill Book Company, First Edition, 1954. 501 pages

The authors of this book have accomplished the difficult task of gathering together all of the varied data of the agricultural drainage field into a notably cohesive and complete work. There have been many studies and research efforts made in this field by various private and governmental agencies and the authors are also numbered amongst those who have contributed much to the growing store of knowledge on farm drainage. There have not been many attempts at presenting this field of agricultural science in a comprehensive form as is done in this book.

The major portion of the first half of the book is devoted to drainage theory which includes the hydraulic aspects as well as the soil chemistry which is related to this subject. This portion of the book also contains rainfall charts and other precipitation data for this country which was gathered from the records of several federal agencies.

The latter portion of the book contains a wealth of information on the practical problems encountered in agricultural drainage engineering and the solutions to these problems. This section covers drain tiles, construction of underdrains, drainage of irrigated lands along with some economic studies on drainage systems. Some of the statistics and photo-

graphs pointing out the loss of usable land due to improper drainage practice are of particular interest in the light of the increasing food requirements of this country's growing population.

Each chapter is followed by a series of questions which makes the book useful as a college text. A.J.B., W.S.E.

Storage Batteries

Storage Batteries, by George Wood Vinal, John Wiley & Sons, Inc., New York, N.Y., Fourth Edition, 1955. 446 pages. Price \$10.00.

Here is a new edition of a standard work on secondary batteries first written in 1924 and previously revised in 1930, and 1940. The author, for 32 years Chief of the Section of Electrochemistry of the National Bureau of Standards, provides detailed information on the physical and chemical characteristics, and reactions of battery materials and electrolytes. He deals throughout not only with lead-acid, and nickel-iron cells but also with nickel-cadmium, and silver oxide batteries.

The book gives the factors that determine battery capacity, and affect battery resistance. There is material on measuring capacity and resistance, and determining battery efficiency. Considerable space is given over to the proper operation and testing of batteries.

Of particular interest to the engineer is the section that deals with the methods of manufacture of various types of batteries, and the detailed treatment of modern special purpose batteries in telephone and railway service and other industrial applications. J.C.B.

Boiler-House Efficiency

Industrial Boiler-House Efficiency, by Charles F. Wade, Crosby Lockwood and Son, Ltd., London, England, First Edition, 1954. 213 pages. Price 15 Shillings (\$2.10).

This book is designed to save money and conserve fuel in the operation of steam generating plants. The author, an English combustion engineer, has drawn on the experience of industrial management with a wide range of sizes of steam plants using for the most part Lancashire and Cornish type boilers but not excluding the fire-, and water-tube varieties.

The author goes beyond discussion of the various types of boilers, however, to present the whole picture of boiler-house efficiency from basic considerations such as fuel characteristics, heat transfer and insulation, and the nature of combustion to the design of fire grates, the condition of the boiler settings, and techniques for handling load fluctuations economically. Even such non-technical phases of plant operation as keeping boiler-house records, and setting up bonus wage plans for efficient firemen are treated in this volume. J.C.B.

CRERAR LIBRARY

News and Notes

An occasion important in the Library's history took place on March 22. Jointly sponsored by the Chicago Heart Association and Crerar Library, a meeting marks the presentation to the Library of two outstanding gifts, the first Latin edition (1628) and the first English edition (1653) of Sir William Harvey's *Exercises Concerning the Motion of the Heart and Blood*. Called "the most important book in the history of medicine," the work has been represented in the Library collections in other editions; the new accessions, through the generosity of a private donor and of the Chicago Heart Association, add stature to the Library's already rich holdings. In addition to the presentations, an address will be given by Dr. Louis N. Katz, President of the Association, and exhibits of Harvey's works and other great classics will be arranged throughout the Library.

The second meeting of Crerar Library Associates was held in the WSE dining room at noon, February 15. Dr. Haldon A. Leedy, Director of Armour Research Foundation, spoke on "Clean Air for Chicago," discussing some of the efforts being made to control smoke pollution of Chicago's atmosphere. A brief review of recent developments in Library operations was also made by H. P. Sedwick, Library board president, and Herman Henkle, Librarian.

The Chicago Chemical Library Foundation approved an appropriation for 1954-55 of over \$5,000 for expenditure by Crerar in improving its holdings of chemical literature. Action at its annual meeting in February makes possible continuing purchases of journals and books which could not otherwise be added, including three additional Russian journals in English translation.

Honey and Vinegar

Tart words make no friends: a spoonful of honey will catch more flies than a gallon of vinegar.

—Poor Richard's Almanack

Osborne Speaks on Welding Standards

Quality standards in welding must be maintained at high levels, for "today's quality will not sell in the markets of tomorrow," a quality control specialist said just recently at the first annual Midwest Welding conference.

Ernest C. Osborne, quality control manager of the Caterpillar Tractor company, addressed the opening session of the two-day conference at Armour Research Foundation of Illinois Institute of Technology, Chicago.

He advocated statistical quality control methods to achieve the high standards, but warned that these methods involve more than simply gathering data and applying mathematical formulas.

"Inspection alone is not quality control," Osborne said. "Control is direction by someone exercising sound judgment with the ability and authority to take corrective action when necessary."

"It is not enough for supervisors and quality control personnel to have targets.

We must have individual targets for all the men who run the machines and work on the assembly lines."

Osborne recommended the control chart as a means of increasing interest in an individual worker's performance. He compared the chart to a highway with shoulders and a ditch on either side.

"If your car gets on the shoulder, it's a caution; if you hit the ditch, it's too late. On a control chart, the control limits are the shoulder and the blueprint dimensions are the ditch."

Chart control gives the worker a feeling of team security because it shows that poor quality is not always due to inferior workmanship, the Caterpillar company official said.

Sometimes the tools are at fault, the material is wrong, or management may be at fault in not providing the most efficient equipment for the job, he said.

"When chart control brings conditions like these to light and management promptly corrects them, the worker feels a confidence in his supervisor. He will be inspired to do his share."

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WSE Personals

R. E. Young, MWSE, has been appointed district superintendent of Public Service Company, Chicago Heights, Ill. He first joined Public Service Company in 1937, and since then has held a number of different positions. They include industrial relations, engineering, rates, and industrial sales. In 1945 he was assigned to Kankakee, Ill. as power engineer. During his ten years in that position he supervised the negotiations for electric service to the dozen or more new plants in that area, and the other industrials who made rather comprehensive changes or additions to their plants. Young, who received his education at Ohio University (Athens) and Northwestern, is a registered professional engineer. Besides the Western Society, he belongs to such other organizations as American Institute of Electrical Engineers and American Welding

Society. He has written several papers, technical and conference, primarily in connection with the American Institute of Electrical Engineers' Committee on Electric Welding.

* * *

Paul Rogers, MWSE, has announced the dissolution of the firm of Rogers & Snitoff, Inc., and the continuation of the organization under the name of Paul Rogers & Associates, consulting engineers, located at 510 North Dearborn St., Chicago 10. The telephone number is SUperior 7-3594. Since Jan. 1 of this year he has been in addition on the faculty of Northwestern University. He is instructing in reinforced concrete at Northwestern's graduate school. To further keep himself busy, he is engaged as a co-author of *Merriam's Civil Engineering Handbook*. His section is concerned with "Miscellaneous Structures in Reinforced Concrete." As a further venture, he is also co-authoring a book with Dr. P. W. Abeles, London, England, on prestressed concrete.

* * *

Charles R. Schular, MWSE, after 41 years of service with Commonwealth Edison Company, has retired. He has moved to Oregon. During most of his years of association with Commonwealth Edison, he was affiliated with "voltage regulation" activities. At the time of retirement he was a supervising engineer.

* * *

Thomas S. McEwan, active for many years in engineering society activities in the Middlewest, announces the formation of his own management consulting engineering firm, Thomas S. McEwan & Associates.

* * *

Frank W. Edwards, MWSE, has been appointed member of the newly established Board of Engineers of the St. Lawrence Seaway Development Corp. He is manager of the Chicago office of the Stanley Engineering Co.

* * *

Perkins & Will, architects in Chicago of which firm **John E. Starrett, MWSE**, is a partner, has received a special citation for its design of Blackhawk elementary school, Park Forest. The design has been entered in a competition sponsored by *School Executive* magazine, in St. Louis. Eight other organizations also received honors.

* * *

Roy Errol Jones, MWSE, for several years executive vice-president, People's Water & Gas Co., North Miami, Fla., is now president and director, North Shore Gas Co., Waukegan. He left the Waukegan utility in 1951 having served since 1942.

* * *

Allan A. Porter, MWSE, formerly manager of erection, American Bridge Division of U.S. Steel Co., is now vice-president in charge of erection with that organization.

* * *

Donald A. Walsh, MWSE, formerly a structural designer with Consoer, Townsend & Associates, is now structural engineer with the firm of Shaw, Metz & Dolio of Chicago. He is working on an air installation in Madrid, Spain.

* * *

F. E. Toensmeier, MWSE, for the past 14 years affiliated with the Rockwood Sprinkler Co., is now president of the newly organized firm, TAK Inc. With the Rockwood firm, for the last three years, Toensmeier specialized on the

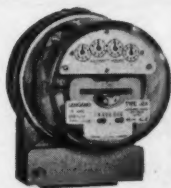
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use of waterspray as applied to oil and hydrocarbon fires. In this respect he demonstrated actual equipment, spoke and showed movies to insurance groups, engineering, and various plant groups throughout the Midwest. For the past seven years he was manager of the Contracting Division dealing with installations for fire protection of all types and descriptions.

O. W. Tuthill, MWSE, formerly chief engineer-state area, with the Illinois Bell Telephone Co., is now general manager-merchandising. **M. W. Casid**, MWSE, has been appointed chief engineer to succeed Tuthill.

Rollin D. Wood, MWSE, has retired as chairman of the Board of the Mississippi Valley Structural Steel Co. J. Bruce Butler succeeds him. Wood had been a member of the firm since 1906. He became president of Mississippi Valley in 1943; chairman of the Board in 1948. He will still participate in the activities of the organization as a member of the Board, and a member of the Finance Committee.

Phillip J. Hanson, MWSE, is now co-manager of the Chicago office of the C. O. Bartlett & Snow Co. of Cleveland. This was announced at a dinner given in honor of his uncle's retirement after 28 years with the company.

John Slezak, MWSE, president of the Turner Brass Works, Sycamore, Ill., on retiring as undersecretary of the Army, received the praises of Army Secretary Stevens. Secretary Stevens, speaking at a meeting of the Quartermasters Association in Chicago, referred to Slezak as a "tower of strength" in the councils of defense.

R. H. Myers, MWSE, who has been with the Illinois Bell Telephone Co. for nearly 30 years, has been named as an assistant vice-president of the firm. He had helped to coordinate activities of Illinois Bell in relation to the state and federal governments, and will continue in this role.

Mario Palmieri, MWSE, and **Salvatore Pasquinelli**, MWSE, have announced the organization of the Palmieri Engineering Co. Their offices are located at 134 N. LaSalle st.

Nuclear Congress Is Announced

Under the leadership of Engineers Joint Council, a dozen organizations representing more than 250,000 American scientists, engineers and industrialists, have united in announcing a Nuclear Congress and Atomic Exposition to be held Dec. 12-17, 1955, in Cleveland.

The Nuclear Congress represents the biggest single project yet undertaken by the combined engineering and scientific societies of the nation. In addition to covering the interrelations of all branches of the nuclear sciences and engineering, both events have the active support of private enterprise and of government in the power and other atomic fields.

Basic objective of the Congress is to launch a continuing program of interchange of information on the developing applications of Nuclear Science by the engineer for vital national benefits involving industry, agriculture, medicine and the public welfare.

Announcement of the Congress was

made jointly by Dr. Thorndike Saville, president of Engineers Joint Council and dean of engineering at New York University; Dr. John R. Dunning, chairman of the General Committee on Nuclear Engineering and Science and dean of engineering at Columbia University; Dr. Donald L. Katz, chairman of the Nuclear Congress Program Committee and chairman of the Chemical and Metallurgical Engineering Departments at the University of Michigan. An exposition, to be held in connection with the Congress, was announced by Prof. Barnett F. Dodge of Yale University and president of the American Institute of Chemical Engineers, direct sponsor of the Exposition.

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American Institute of Chemical Engineers

American Chemical Society

American Institute of Physics

American Nuclear Society

Atomic Industrial Forum

In addition to the above, the Institute of Aeronautical Sciences and American Geological Institute are expected to cooperate in the Congress program. Participation in the Congress is open to all major technical groups having an interest in nuclear engineering in any form.

Coordinating the complex organization of the Congress activities is the Engineers Joint Council through Brig. General Stewart E. Reimel, (Ret), EJC secretary. The eight EJC member so-

cieties are included in the co-sponsors. Local arrangements in Cleveland for the Congress are being handled by the Cleveland Engineering Society, Ralph R. West, president.

Sponsors of the forthcoming Congress called attention to the stimulus given industry plans by the announcement of the Government but recently that the Atomic Energy Commission has called for proposals by private companies on construction of reactors for industrial purposes. It was stated by the Government that help would be given companies presenting acceptable proposals. Power plants are only one of the many projects of the future to be discussed at the Congress.

Dr. Dunning, in describing the scope of the Cleveland meetings, said "The Nuclear Congress will be the most comprehensive program of papers and discussions looking toward industrial uses of the atom to benefit all mankind. Many of the nation's most eminent scientists and engineers will participate. Out of the week of meetings should come impor-

tant guideposts to the nation's peacetime development of nuclear energy."

"Timing of the Nuclear Congress and Atomic Exposition has been carefully selected to come as soon as possible after the closed UN "Atoms-for-Peace" meeting in Geneva.

"Expected de-classifying of currently restricted information following the Geneva meetings, will make possible open discussion and planning at the Cleveland Congress, looking toward wider-scale peaceful uses of atomic energy. Emphasis will be on industrial possibilities," Dunning added.

Dr. Katz said the program would include addresses and papers on nearly 100 technical and management subjects. "While there will be some joint sessions, many of the meetings will be concurrent. Each of the participating groups has substantial practical or educational interest in the Congress and its purposes. While much of the program will be devoted to scientific and engineering aspects, considerable attention will be centered on management problems. Many of the scientific papers will be the first public discussion of important atomic field developments," he added.

Atomic Exposition

In announcing the world's first major Atomic Exposition, Professor Dodge, president of the organization directly sponsoring the show, said: "The Exposition will for the first time bring together under one roof all the major developments in industry and science related to atomic energy. This includes not only atomic power developments, but also the tremendously expanding applications of atomic by-products in all kinds of industrial fields. Suppliers to the various atomic industries are also being invited to display their latest developments relating to peace-time applications.

"While attendance will be drawn chiefly from management and technical professions, it is planned to open the Exposition to the public at certain hours."

A Thought

None but the well-bred man knows how to confess a fault, or acknowledge himself in an error.

—Poor Richards Almanack

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New Alloy To Appear on Scene

New alloys based on such elements as vanadium, chromium, rhenium and silicon will appear on the industrial scene within a few years.

That is the opinion of Robert A. Lubker, manager of the metals research department at Armour Research Foundation of Illinois Institute of Technology, Chicago.

Lubker said vanadium base alloys having a density of about 6 may provide a long-range answer to the problem of improved elevated temperature alloys for aircraft frames.

New metallurgical processes, Lubker predicted, will provide ways of salvaging materials now discarded or lost for various reasons. He cited steel lost through the discard of tin cans and manganese lost in open hearth slag as examples of materials that might be saved.

"It is interesting to note that the United States discards more manganese than is required for the steel industry, although the country is almost completely deficient in this important steel-making alloy," Lubker pointed out.

He further forecast that improved metallurgical processes will be developed to permit commercial utilization of lower grade ores as richer deposits are depleted.

The metallurgical profession, Lubker reported, is developing titanium alloys suitable for use in the faster, more maneuverable, "greater payload," and longer-range aircraft conceived by design engineers. "The application of existing alloys," he said, "has been pushed to the breaking point."

Lubker stated that new alloys are being designed to give the necessary improvement in strength at elevated temperatures combined with relatively low density.

For instance, titanium alloys with a density of about 4.5 and a modulus of 16 million psi which will withstand a stress of 50,000 psi at a temperature of 1,000 degrees Fahrenheit have been developed, he pointed out.

Lubker added that improved alloy steels also warrant serious consideration for this application, depending on the ultimate operating temperature of the aircraft.

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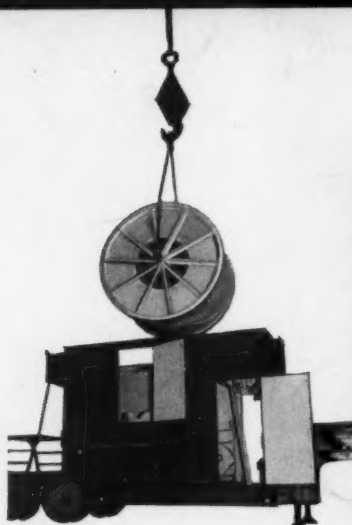
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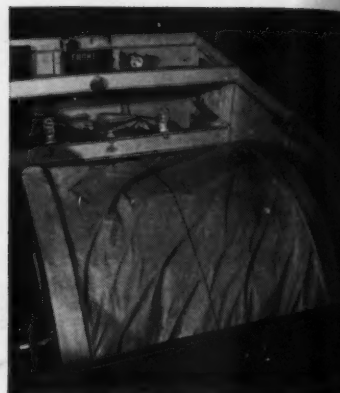


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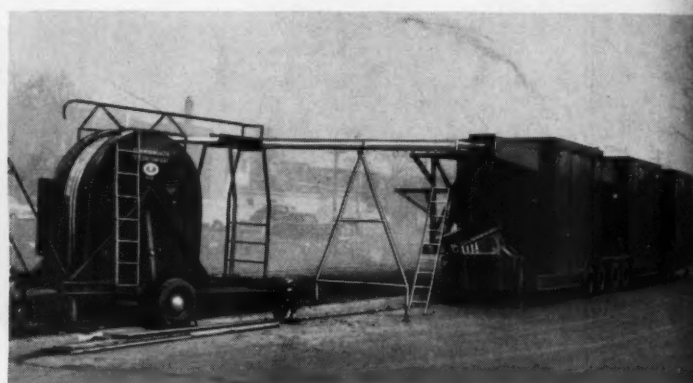
2. Reel of cable without lead sheath, rests inside trailer.



3. Watertight cover keeps cable dry until it goes underground.



4. Trailer (one of 3) is towed to job site with cable safely inside.



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6. Close-up shows how cable is fed from rear to middle trailer.



7. Cable from 2 rear reels passes into front trailer to join 3rd cable.



8. Three-cable line goes underground to be enclosed in steel pipe.

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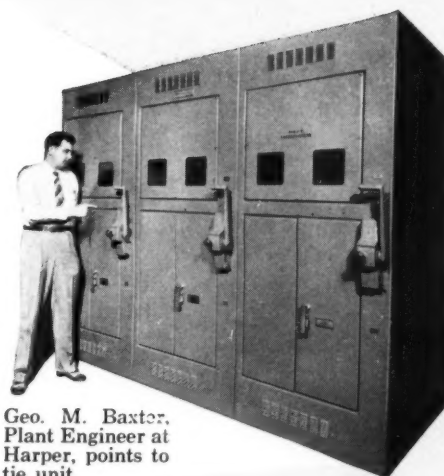
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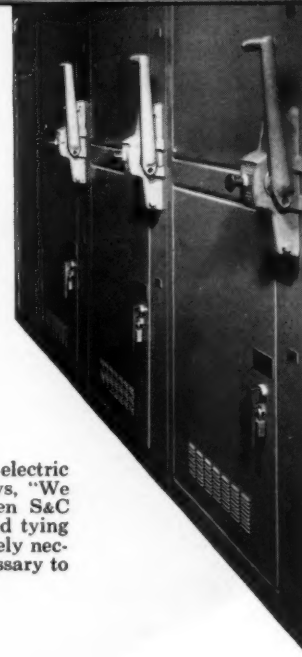
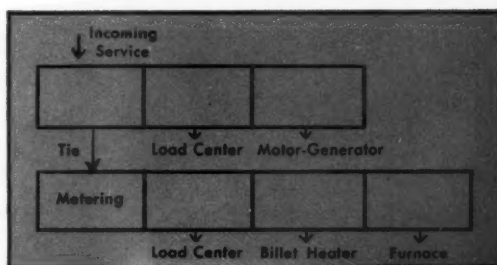
The first step was installation of S&C Metalclad Switchgear—a 3-unit assembly which served a load center and a motor-generator, and provided a spare for future needs. Two years later a second 4-unit assembly was added to serve the new metals plant, and was tied to the incoming service through the spare unit of the original assembly.



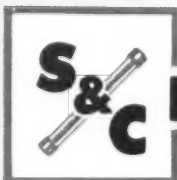
S&C Metalclad Switchgear is engineered to perform all the necessary protective and switching functions—yet it costs only about half as much as most alternate equipment. As a result the economies from its use are often tremendous.

Mr. Don Rieger

of C & H Electric Co., who planned and installed the electric power distribution system at The H. M. Harper Co., says, "We were especially pleased that our original choice had been S&C Metalclad Switchgear when the latest changes necessitated tying the two switchgear assemblies together, because it was merely necessary to change fuses in the tie-in unit . . . it was not necessary to replace expensive breaker equipment."



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heater, furnace,
and load center,
and supplies
metering.



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WESTERN SOCIETY OF ENGINEERS

Serving the Engineering Profession



FEBRUARY, 1955

PART TWO

Vol. 7, No. 10

Message from the President

With our current expansion program completed, the Western Society of Engineers now has adequate facilities to meet the many and varied demands of its members.

Many excellent programs are being presented by the Society to keep our members abreast of the latest technical advances and engineering developments. These programs in addition are providing a means for stimulating new ideas so essential to the progressive engineer of today.

There is a real need for greater association between the mature engineer and those who are relatively new in the profession. Engineers are not only the designers and builders of material things—they also have the responsibility for helping to develop the engineer of tomorrow.

The Society, in addition to its technical sessions and educational programs, is helping to develop the young engineer through the Young Engineers Forum. The Fifth Forum, given last fall, was one of the most successful. All of the engineers, both young and old, participating in the Forum programs have expressed a keen appreciation for the worthwhile benefits received.

Individual members can help fulfill their obligations to the young engineer through greater participation in the Western Society's activities, particularly in committee work. Only when we as individuals recognize this responsibility will we realize the many advantages that the Western Society of Engineers has to offer.

John F. Sullivan, Jr.

The Western Society Of Engineers

CONSTITUTION

Adopted May 31, 1922 with Subsequent Amendments
Including Amendment Adopted May 31, 1954

ARTICLE I Name and Location

Sec. 1. The name of this association shall be The Western Society of Engineers.

Sec. 2. The offices of the Society shall be located in the City of Chicago, Illinois.

ARTICLE II Objects

Sec. 1. The objects of this Society shall be the advancement of the theory and practice of engineering, the improvement of the status of engineering practice as a profession, and the maintenance of high professional standards.

ARTICLE III Seal

Sec. 1. The seal of the Society shall be as reproduced herewith.



Sec. 2. All official instruments issued by or under the authority of the Society shall be authenticated by this seal. The Secretary of the Society shall be the custodian of the seal.

ARTICLE IV Policy

Sec. 1. The Society shall neither endorse nor recommend any individual or any scientific or engineering production, except in the interest of the public or the profession. The opinion of the Society may be expressed on such subjects as pertain to the public welfare.

ARTICLE V Membership

Sec. 1. The membership shall be open to persons of good character skilled or interested in engineering.

Sec. 2. The membership shall be divided into grades to be known as Honorary Members, Members, Associate Members, Student Members and Affiliate Members.

Sec. 3. The Honorary Members, Members and Associate Members shall constitute the corporate membership of the Society and have the exclusive right to vote and hold office.

Sec. 4. An Honorary Member shall be a person of acknowledged eminence in engineering, or in

a science related thereto, or who has rendered outstanding service to the engineering profession. There shall be no more than fifteen such members at any one time; no more than two may be elected in any one fiscal year.

Sec. 5. A Member, at the time of his admission or advancement to that grade, shall:

Be a graduate of an engineering curriculum approved by the Board of Direction of the Society and shall in addition have had not less than four years of increasingly important engineering experience, indicative of growth in engineering competency and achievement and of a character satisfactory to that Board, at least two years of which shall be in responsible charge of engineering work.

Or, if not a graduate, he shall have had equivalent attainments including not less than ten years of increasingly important engineering experience, indicative of growth in engineering competency and achievement and of a character satisfactory to the Board of Direction of the Society, at least two years of which shall be in responsible charge of engineering work.

Sec. 6. An Associate Member shall, at the time of his admission or advancement to that grade, be:

A graduate of an engineering curriculum approved by the Board of Direction of the Society.

Or, if not a graduate, he shall have equivalent attainments, including at least six years of engineering experience of a character satisfactory to the Board of Direction.

Sec. 7. A student Member shall be registered in an undergraduate or a graduate engineering curriculum approved by the Board of Direction of the Society and shall be pursuing a course of study in preparation for the engineering profession.

He will become an Associate Member automatically upon graduation from said approved course, which graduation is properly attested by a statement from the school or college.

Sec. 8. An affiliate Member shall be a person not qualified for Member or Associate Member grades, but who is interested in the advancement of engineering, as may be evidenced by an employment which has involved dealing or associating with engineers in an executive, professional, or sales capacity for a period of at least two years.

Sec. 9. A non-graduate of an engineering curriculum approved by the Board of Direction may be allowed one half year credit toward the required experience specified in Sections 5 and 6 for each year of such curriculum satisfactorily completed but not to exceed a total of one and one half years.

An applicant who has attended a non-accredited engineering curriculum may be given credit for work satisfactorily completed at the rate of one third year credit for each year of study satisfactorily completed but not to exceed a total of one year.

Sec. 10. All members whose residence or principal place of business is within fifty miles of the Chicago post office shall be deemed resident; those beyond that limit shall be deemed non-resident.

ARTICLE VI Admissions and Resignations

Sec. 1. All elections to membership shall be made by the Board of Direction. The affirmative vote of a majority of the entire membership of the Board shall be required for election to all grades except Honorary Member. Each candidate elected shall be duly notified of his election, and shall indicate his acceptance of membership by subscription to the Constitution and the payment of entrance fee and dues. If acceptance is not received within sixty days from the date of election, it shall be void unless the time shall be extended by the Board.

Sec. 2. Proposal for Honorary membership shall be submitted in writing by at least fifteen Corporate Members, who shall state their reason for the proposal. Election shall be by ballot, and shall require the affirmative vote of three-fourths of the entire membership of the Board. A person so elected shall be notified promptly by letter. The election shall be void if acceptance is not received within three months after mailing such notice.

Sec. 3. A member may resign by advising the Secretary in writing to that effect. The Secretary shall present such communication to the Board of Direction at its next regular meeting and it shall accept the resignation when all dues are paid.

ARTICLE VII Fees and Dues

Sec. 1. The fees and dues for the various grades of membership shall be as follows:

	Annual Dues		
	Entrance Fee	Resident	Non-Resident
Honorary	None	None	None
Member	\$20.00	\$20.00	\$13.50
Assoc. Member (First 7 yrs. in grade)	10.00	10.00	6.50
Assoc. Member (After 7 yrs. in grade)		20.00	13.50
Assoc. Member (Transfer from student member)	None	10.00	6.50
Affiliate Member	16.50	16.50	11.50
Student Member	None	3.50	3.50

From each of these annual dues \$2.50 shall be set aside as subscription to the publication of The Western Society of Engineers.

On transfer to a higher grade, the entrance fee previously credited to a member shall be

applied against the entrance fee for the new grade.

Sec. 2. A person elected to any grade of membership shall pay dues for the fiscal year in which elected, proportional to the part of the year remaining at the time of election.

Sec. 3. If the dues of any member are not paid before December first, he shall lose the right to vote and to receive the publications of the Society.

The Board of Direction may, by an affirmative vote of a majority of its members, grant extension, or excuse members from payment of dues, or waive the entrance fee if in the best interests of the Society.

Sec. 4. A member shall be liable for the payment of dues until he shall have resigned, been expelled, or relieved from the payment of said dues in accordance with the provisions of this Constitution.

Sec. 5. Corporate and Affiliate Members over sixty years of age shall not be billed for dues after having paid thirty years' dues. Such members shall be known as Life Members, but this designation shall not be construed to establish a separate grade of membership.

Sec. 6. The fiscal year shall commence with the first day of June.

ARTICLE VIII

Officers

Sec. 1. The officers of the Society shall be a President, a First Vice President, a Second Vice President, a Secretary, a Treasurer and twelve Trustees.

Sec. 2. A vacancy in any of these offices shall be filled for the unexpired term by the Board of Direction. The appointee so selected shall not be ineligible for election to succeed himself.

ARTICLE IX

Management

Sec. 1. The management of the Society shall be vested in a Board of Direction, consisting of the President, the two Vice Presidents, the Treasurer, the twelve Trustees and the two most recent Past Presidents who continue to be members.

Sec. 2. The Board of Direction shall hold regular meetings at least once every month. A majority of the entire membership of the Board shall constitute a quorum. Special meetings shall be called upon the order of the President, or at the written request of three members of the Board.

Sec. 3. The Board shall supervise the investment and care of the funds of the Society; prescribe the system of accounts; make appropriations for specific purposes; act upon applications for membership as provided in Article VI, Section 1; adopt and revise such By-Laws as may be necessary for the proper conduct of the affairs of the Society and are not inconsistent with this Constitution; appoint such committees as are provided for in the By-Laws; and perform such other acts as are not inconsistent with this Constitution.

ARTICLE X

Nomination and Election of Officers

Sec. 1. The President, the Vice Presidents and the Treasurer shall be elected annually and shall hold office for one year and until their successors

are elected and qualified. The trustees shall hold office for three years, four being elected each year starting with the fiscal year beginning June 1, 1954. For the fiscal year beginning June 1, 1952, six trustees, in addition to those elected, shall be appointed for one year by the Board of Direction. For the fiscal year beginning June 1, 1953, eight trustees shall be elected, four for a three year term, two for a two year term, and two for a one year term.

Sec. 2. The Secretary shall be elected by the Board of Direction at its first regular meeting in each fiscal year or at an adjourned session thereof. An affirmative vote of a majority of the entire Board shall be required for election. He shall hold office for one year or until his successor is elected and qualified.

Sec. 3. Each December the Board of Direction shall elect a Nominating Committee of seven Corporate Members, of whom one, and only one, shall be a member of the Board, and not more than three of whom shall have served on the Nominating Committee within the previous three years. The appointment of this Committee shall be announced and suggestions for nominees solicited in the next regular issues of the publication of the Society.

Sec. 4. The nominating committee shall meet not later than January fifteenth and organize by electing from its membership a chairman and a secretary. It shall nominate a President, a First Vice President, a Second Vice President, a Treasurer and four Trustees, except that eight Trustees shall be nominated for the fiscal year beginning June 1, 1953 for the terms provided for in Section 1 of this Article. Before reporting to the Board, the committee shall secure the acceptance of each nominee.

The Committee shall present its report to the Board of Direction at its regular February meeting. If the Board of Direction shall find any nominee ineligible for the office for which he is nominated, or if any vacancy should occur from any cause, the Board shall select another nominee therefore. The nominations so reported shall be known as the Regular Ticket.

Promptly after the February meeting of the Board of Direction, a copy of the Regular Ticket shall be mailed to every Corporate Member.

Sec. 5. Additional nominations for any office provided for in Sec. 4 of this Article may be made by petition signed by at least twenty Corporate Members. Such petition shall be accompanied by the acceptance of the nomination by each nominee in writing and shall be filed with the Secretary of the Society before the twentieth day of March. Any petition so filed shall be presented to the Board of Direction at its regular March meeting. If the Board shall find any person so nominated ineligible for the office for which he is nominated, the petition as it relates to such nominee shall be rejected. Nominations made in accordance with this section shall be known as a Ticket by Petition.

Sec. 6. Corporate Members who are in arrears in the payment of their dues shall not be eligible for office.

Sec. 7. The President shall not be eligible for re-election.

Sec. 8. On or before the first day of April a letter-ballot shall be sent to each Corporate Member on which shall appear the names of all the candidates to be voted upon, so arranged as to indicate nominees of the Regular Ticket and of the Ticket, or Tickets, by Petition.

Sec. 9. The polls shall close at 12 o'clock noon, the fourth Monday in April. The Secretary shall certify to the competency of the voters and

deliver their ballots to three Judges of Election appointed by the Board. These Judges shall canvass the ballots publicly and report the results of the canvass to the Board, which shall, by resolution, declare elected to their respective offices those candidates who have received a plurality of the votes cast. In case of a tie vote between two or more candidates for the same office, the Board shall decide by ballot between the candidates thus tied.

Sec. 10. The officers-elect shall assume their duties on the first day of June.

ARTICLE XI

Duties of Officers

Sec. 1. The President shall have general supervision of the affairs of the Society. He shall preside at meetings of the Society, and of the Board of Direction; shall appoint all committees not otherwise provided for, subject to the approval of the Board; and shall be an ex-officio member of all committees. He shall, jointly with the Secretary, sign all contracts and other written obligations of the Society which have been approved by the Board. At the Annual Meetings, he shall report on the general condition of the Society. The Vice Presidents in order of seniority shall preside at meetings and perform the duties of the President in his absence or in case the office becomes vacant.

Sec. 2. The Treasurer shall receive and deposit all moneys of the Society as designated by the Board of Direction. He shall pay all bills when approved in accordance with rules prescribed by the Board. He shall keep regular accounts of all receipts and expenditures in such form as the Board prescribes; which record shall be open at all times to inspection by the Board. He shall give a bond in such amount and with such sureties as the Board may require. He shall make an Annual Report, and such other reports as the Board may require.

Sec. 3. The Secretary shall be the Executive Officer of the Society, subject to the direction of the President and the Board. He shall have charge of the property of the Society, and shall conduct its business, under rules prescribed by the President, sign all contracts and other written obligations approved by the Board. He shall make and preserve a record of all proceedings of the Board. He shall make an Annual Report, and such other reports as the Board may require. He shall give a bond in such amount and with such sureties as the Board may require. The amount of his salary shall be determined annually by the Board at its first regular meeting.

ARTICLE XII

Subdivisions

Sec. 1. The Board of Direction may authorize the formation of subdivisions of the Society for the more convenient study and discussion of special fields or functions of engineering, as set forth in the By-Laws.

ARTICLE XIII

Meetings

Sec. 1. The Annual Meeting of the Society shall be held on the first Monday in June, at which time the Annual Reports shall be received and other business transacted.

Sec. 2. Other meetings may be called by the President; and shall be called on the request of

ten Corporate Members, which request shall state the purpose of the meeting. Not less than one week prior to the date of each such meeting, the Secretary shall mail to each member a notice which shall state the purpose of the meeting; and no other business shall be considered thereat.

Sec. 3. At all meetings of the Society twenty-five Corporate Members shall constitute a quorum.

Sec. 4. Technical and social meetings of the Society and of its subdivisions shall be held at such times and places as may be provided in the By-Laws or approved by the Board.

ARTICLE XIV Discipline

Sec. 1. The Society, through its Board of Direction, shall have the power to investigate and pass upon the conduct of its members alleged to be in violation of the Code of Ethics of the Society or otherwise inimical to the interests of the engineering profession or the Society.

Sec. 2. Upon alleged misconduct of a member coming to the notice of the Board, or upon filing of charges against a member signed by ten or more Corporate Members, the Board shall examine the charges, and if there appears to be sufficient reason for a hearing thereon, shall fix a date for such hearing, and shall, not less than thirty days before said date, notify the accused thereof by registered letter sent to his last known post office address, accompanied by a copy of

the charges and a copy of this Article. At the hearing, the accused may hear all charges and all evidence adduced in support thereof, hear and at his option cross-examine any witnesses called in support of the charges, produce and examine witnesses in his defense, offer documentary evidence, and make an oral and a written statement in his own behalf. Promptly after the conclusion of the hearing, the Board shall consider the evidence and render its decision. A two-thirds vote of the entire Board shall be necessary to sustain the charges. If they are thus sustained, the Board shall fix the penalty at suspension for a stated period or expulsion, and shall notify the member that the decision becomes effective at the end of one month unless the accused previously enters a written appeal therefrom.

Sec. 3. Appeals shall be submitted to the Corporate Members by letter-ballot in a form to be prescribed by the Board. The ballot shall be accompanied by a statement of the charges, the Board's action thereon, together with such information as is deemed proper, and the defense of the member making the appeal. Twenty days after being sent to the Corporate Members, the ballots shall be canvassed by the Board. A majority of the votes cast shall be required to sustain the action of the Board. The Board shall notify the appellant and the Corporate Members of the result of the canvass of the ballots.

Sec. 4. No disciplinary proceedings of the Society shall be given publicity except as provided in this Article.

ARTICLE XV Amendments

Sec. 1. Proposed amendments to the Constitution shall be submitted to the Secretary in writing and signed by not less than twenty-five Corporate Members.

The proposed amendments shall be submitted to the Board of Direction at its next regular meeting and referred by it to the Amendments Committee, which shall report on them to the Board not later than the following regular meeting of the Board.

Sec. 2. Proposed amendments, unless withdrawn, shall be printed and mailed to all Corporate Members at least fifteen days prior to the meeting of the Society at which they shall be the order of business for discussion; they may be modified in any manner pertinent to the original amendments by a majority vote of the Corporate Members present at such meeting.

Sec. 3. The proposed amendments shall then be voted upon by letter-ballot, which ballot shall be due not later than thirty days after the meeting provided for in Sec. 2 of this Article and shall be counted promptly thereafter. In balloting on proposed amendments to the Constitution, an affirmative vote of two-thirds of all the ballots cast shall be necessary for adoption. Amendments so adopted shall take effect at the next Annual Meeting, unless the amendments are accompanied by a resolution of the Board providing that they shall take effect at an earlier date.

BY-LAWS Including Amendment Adopted Sept. 23, 1955

ARTICLE I

Admission to Membership

Sec. 1. Applications for admission, transfer or reinstatement shall be in such form as the Board of Direction may prescribe. They shall embody a concise statement of the candidate's education and professional experience, with dates and descriptions of work in which he has been engaged.

Sec. 2. Sub-professional Work is to cover the time spent as rodman, chainman, recorder, or draftsman; and also the time spent as instrumentman or inspector when working under direct supervision or on work where the personal responsibility and technical knowledge required are small; that is, minor positions in which the responsibility is slight and the individual performance of a task, set and supervised by a superior, is all that is required. It shall also include time during which he has been occupied in engineering work before he is 21 years old, except as modified by the statement in regard to education of Professional Work. No account is to be taken of work done before the applicant is 16 years old, or of work performed during vacations. In figuring the years of "active practice in engineering work" each year of Sub-professional Work shall be rated as equivalent to one-half year of Professional Work.

Responsible Charge of Work Means

a. In the field, the applicant must have had the direction of work, the successful accomplishment of which rested upon him, where he had to decide questions of methods of execution and suitability of materials, without relying upon advice or instructions from his superior, and of supplying deficiencies in plans or correcting errors in design without first referring them to

higher authority for approval, except in cases where such approval is a mere matter of form.

b. In the office, the applicant must have had to undertake investigations, or carry out important assignments, demanding resourcefulness and originality, or to make plans, write specifications and direct the drafting and computations for designs of engineering work, with only rough sketches, general information and field measurements for reference and guidance.

c. In engineering teaching, the applicant must have taught in an engineering school of recognized reputation, and must have had, at least, a grade of assistant professor, or its equivalent.

Design means all that is given above as responsible charge of work in the office, and more. One qualified to design must be able, in the case of any desired piece of engineering, to meet the exigencies of the case, to fulfill the requirements of local circumstances and conditions, and yet not violate any of the canons of engineering. His plan, when executed, must successfully answer the purpose for which it was designed.

Professional Work shall include only the time after the applicant is 21 years old, during which he has been occupied in engineering work of a higher grade and responsibility than that above defined as Sub-professional Work. Time spent in engineering teaching subsequent to graduation shall be listed as professional work.

Sec. 3. An applicant for admission, transfer or reinstatement shall refer to at least three members to whom he is personally known. An applicant for Student grade need refer only to the dean or other authority of the school in which he is enrolled.

Sec. 4. If sufficient information is not received from the requisite number of references, the

Secretary shall call on the applicant for additional references. Applicants who may not be personally known to the requisite number of members may be recommended for membership by three members of the Board of Direction after evidence has been secured sufficient, in their opinion, to warrant admission.

Sec. 5. The names of all applicants shall be published with a request for information regarding their qualifications for membership in the Society.

Sec. 6. Any applicant for admission or reinstatement, whose application may have been rejected by the Board of Direction, may make a new application at any time after one year from the date of the rejection of his previous application. Such new application shall be considered in conjunction with the previous application.

ARTICLE II Fees and Dues

Sec. 1. Dues shall be payable annually in advance and shall become due on the first day of June of each year.

Sec. 2. Any person whose dues are more than three months in arrears shall be notified of this fact promptly by the Secretary.

Sec. 3. On December 1 of each year the Secretary shall notify all members, whose dues remain unpaid, of the provisions of Article VII, Section 3, of the Constitution. The Secretary shall report on the status of unpaid dues at the April meeting of the Board.

Sec. 4. Any member whose dues remain unpaid shall be reported to the Board at the May meeting, and, unless payment is received or ex-

tension is granted, his membership shall terminate at the close of the fiscal year.

ARTICLE III

Duties of Officers and Committees

Sec. 1. At the first meeting of each new Board, one of the Trustees shall be designated as Assistant Secretary, who shall serve without compensation.

Sec. 2. The Secretary, or in his absence the Assistant Secretary, shall attend all meetings of the Board of Direction. The Secretary or his authorized representative shall attend all meetings of the Society and its Sections.

Sec. 3. The Secretary shall be responsible for the employment and supervision of such staff as may be necessary to carry on the work of the Society, including one or more Assistant Secretaries, providing that the employment of such staff is authorized by the Board of Direction.

Sec. 4. All vouchers or checks drawn against the funds of the Society shall be payable only when signed by the Treasurer, President or one of the Vice-Presidents and countersigned by the Secretary or Assistant Secretary.

Sec. 5. The Board of Direction may create an Executive Committee, consisting of the President, the Immediate Past President, the Vice Presidents and the Treasurer, which committee shall exercise such authority of the Board as may be delegated to it when the Board is not in session. It shall report at each regular meeting of the Board of Direction. The Executive Committee shall not have power to amend the By-Laws, elect or expel members, or fill vacancies on the Board of Direction.

Sec. 6. The Board of Direction shall appoint: A Finance Committee, a Program Committee, a Publications Committee, a Library Committee, an Admissions Committee, an Amendments Committee and a House Committee.

Each of these committees, except the Amendments Committee, shall be composed of not less than three Corporate Members of the Society, at least one of whom shall be a member of the Board. The Amendments Committee shall be composed of five Corporate Members of the Society, three of whom shall be the three latest Past Presidents who continue to be members of the Society. At least one member of the Finance and of the Library Committees and two members of the Program and of the Publications Committees shall have served on the same committees during the previous year. The chairman of the Program Committee shall be an ex-officio member of the Publications Committee and the chairman of the Publications Committee shall be an ex-officio member of the Program Committee.

Sec. 7. The Finance Committee shall have immediate supervision over the financial affairs of the Society and shall report thereon monthly to the Board. It shall certify all bills for payment. It shall appoint a registered public accountant to supervise the accounting and to audit the books of the Society, as of May 31 of each year, which audit shall be included in its report.

The Finance Committee shall submit to the Board of Direction at the regular July meeting in each year a budget of expenses for the current fiscal year. Only routine office expenses shall be incurred in advance of the approval of the budget, except by specific authorization of the Board of Direction.

Sec. 8. The Program Committee shall be responsible for all programs for all meetings of the Society at large, the Sections and the Divisions.

It shall commence planning these programs promptly after appointment and not later than the beginning of the third month of the administrative year. The Program Committee shall organize and arrange all programs for meetings of the Society at large. It shall receive the assistance of the Executive Committees of the Sections and the Councils of the Divisions for the purpose of supervising and coordinating all programs for meetings of the Sections and Divisions.

Not later than one month after the close of the administrative year, the committee shall submit its annual report which shall include a complete tabulation of all meetings of the Society, and its Sections and Divisions, together with any recommendations and suggestions which it believes will be of benefit to the Society.

The Committee shall prepare rules, which, when approved by the Board of Direction, shall govern the preparation and presentation of papers.

Sec. 9. The Publications Committee shall supervise the publications of the Society. It shall prepare rules, which when approved by the Board of Direction, shall govern the publications of the Society.

Sec. 10. No paper for presentation or material for publication shall be accepted, which contains information readily found elsewhere, or especially advocates personal interests, or is carelessly prepared, or is foreign to the purposes of the Society.

Sec. 11. The Library Committee shall have general supervision over the library, the relations between The Western Society of Engineers and the John Crerar Library as established under the contract between the two organizations, and the library services established between the Society and the John Crerar Library.

Sec. 12. The Admissions Committee shall investigate all applications for membership and report thereon to the Board of Direction.

Sec. 13. The Amendments Committee shall consider and make a report to the Board on all proposed amendments to the Constitution referred to it in accordance with Article XV, Sec. 1, of the Constitution. It shall also give consideration to formulation and/or revisions of the By-Laws and/or Rules which it considers desirable, or which are referred to it, and shall report to the Board thereon.

Sec. 14. The House Committee shall have general supervision of the rooms in the Society's headquarters and property therein.

ARTICLE IV

Subdivisions

(Sections, Divisions and Branches)

Sec. 1. A section shall consist of members of the Society interested in the more intimate study and discussion of a particular field of engineering. A section may be formed upon the written application to the Board of five per cent or more of the membership of the Society if in the opinion of the Board, it is in the interest of the Society as a whole.

Sec. 2. A division shall consist of members of the Society whose professional interests are of the same general character but not restricted to any particular field of engineering. A division may be formed upon the written request of forty or more members of the Society if in the opinion of the Board, it is in the interest of the Society as a whole.

Sec. 3. The Board of Direction may at its discretion abolish a section or division if more than three months elapse from the date of author-

ization of such section or division before it is in active operation, or if at any time its membership falls below the number required for authorization, or for other satisfactory reasons; but this action shall be taken only after a resolution to abolish such section or division shall have been introduced at a regular meeting of the Board and laid over until a subsequent meeting, at which latter meeting the affirmative vote of two-thirds of the entire membership of the Board, obtained by letter-ballot if necessary, shall be required.

Sec. 4. A branch shall consist of members of the faculty, other instructing staff, and students enrolled in an engineering course in a college of recognized standing.

Sec. 5. The organization, management and operation of sections, divisions and branches shall be in accordance with rules approved by the Board of Direction.

ARTICLE V

Meetings

Sec. 1. Meetings of the Society and of its subdivisions, for the presentation and discussion of papers, or for social purposes, shall be held as authorized by the Board of Direction, and shall be open to the public except as may be ordered by the Board.

Sec. 2. Regular meetings of the Board of Direction shall be held during the fourth week of each month on call from the President.

The minutes of Board meetings shall be transcribed and sent promptly to each member of the Board.

ARTICLE VI

The Western Society of Engineers Foundation

Sec. 1. The endowment funds of The Western Society of Engineers shall be held in the Western Society of Engineers Foundation.

Sec. 2. A standing Foundation Committee shall be created consisting of five past resident Presidents of The Western Society of Engineers. Members of the initial committee shall be appointed by the President of the Society with the approval of the Board of Direction for terms of one, two, three, four and five years respectively. Not later than one month after the close of the administrative year the President of the Society, with the approval of the Board of Direction, shall appoint a new member who shall be a resident past President to replace the committee member whose term has expired, and also additional committee members to fill any vacancies on the committee which have occurred during the previous administrative year. The Executive Secretary of the Society will be a non-voting member of the committee.

Sec. 3. The members of the Foundation Committee may from time to time adopt such resolutions and regulations (not in conflict with the constitution and by-laws of the Society) and may alter and amend the same, as they shall deem advisable for the regulations and transaction of their business. They may prescribe the times of regular and special meetings of the Foundation Committee which may be held without any further notice thereof. The quorum necessary for the transaction of business at a meeting of the Foundation Committee shall be three of the voting members present personally. Such quorum shall have full power to exercise all or any of the powers, authorities and discretions vested in the Foundation Committee. The actions of the Found-

Foundation Committee shall be evidenced by resolutions passed by it at a meeting; provided, however, that any action within the authorities of the Foundation Committee may be taken without a meeting by any three or more members and may be evidenced by a writing in any form bearing the signatures of three or more such members.

Sec. 4. Unless otherwise limited or restricted by the terms of any gift to the Foundation, the Foundation Committee may recommend expenditures of income and principal of the Foundation in such manner and in such amount as they in their discretion, shall determine to be in accordance with the objects of this Society in the advancement of the science of engineering and the best interests of the engineering profession.

Sec. 5. The expenditure of funds of the Foundation shall be limited to those recommended by the Foundation Committee. Such expenditures shall be made by and under the direct supervision of the Board of Direction. The Board of Direction shall have full power, authority and discretion to invest, reinvest, exchange, retain, sell and otherwise deal with the property from time to time comprising the Western Society of Engineers Foundation.

Sec. 6. All vouchers or checks drawn against the funds of the Foundation shall be payable only when signed by the Treasurer, President or one of the Vice Presidents and countersigned by the Secretary or Assistant Secretary.

ARTICLE VII Miscellaneous

Sec. 1. The Board may formulate rules, conforming with the Constitution and By-Laws, relating to any affairs of the Society. Such rules may be adopted at any regular meeting of the Board by the affirmative vote of a majority of the entire membership of the Board and shall take effect on adoption.

Sec. 2. In all questions involving parliamentary rules, not covered in the Constitution and By-Laws, Robert's Rules of Order shall govern.

Sec. 3. Any member who has complied with the provisions of the Constitution shall be entitled to a diploma certifying his grade of membership. It shall be signed by the President, attested by the Secretary, and bear the seal of the Society.

Sec. 4. The Society may issue badges to its members. The badges shall be of a design approved by the Board, shall bear distinguishing marks for the different grades and may have members' names and dates of membership engraved thereon. Prices of badges shall be fixed by the Board.

Sec. 5. Diplomas and badges shall be issued only on agreement providing for their return on demand of the Board in case of termination of membership.

Sec. 6. It shall be the duty of all members to call the attention of the Secretary to the im-

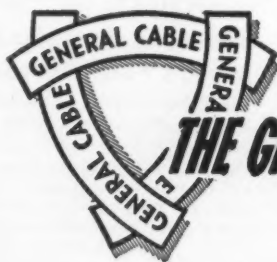
proper use of the Society badge or symbols, or to claims made by nonmembers that they are members of the Society. The Secretary shall make an investigation and present the facts to the Board.

Sec. 7. The official record of the Society shall be known as the Midwest Engineer of The Western Society of Engineers. It shall be published under the direction of the Publication Committee; shall contain technical papers and discussion, and may include the Constitution, By-Laws, Rules of the Board, annual reports, the membership directory, and such other information as the Board may prescribe.

Sec. 8. The administrative year of all committees, officers of Sections and Divisions and all commissions created by the Society shall coincide with the administrative year of the Society as provided in Article X, Section 10 of the Constitution.

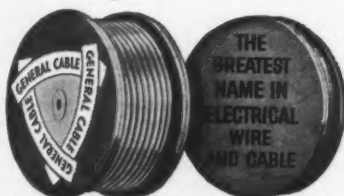
ARTICLE VIII Amendments

Sec. 1. Any proposed amendment to these By-Laws shall be presented in writing at a regular meeting of the Board, and shall be voted upon at the next regular meeting. The Secretary shall mail a copy to each member of the Board at least fifteen days before the meeting at which action on such amendment is to be taken. An affirmative vote of two-thirds of the entire membership of the Board, obtained by letter-ballot if necessary, shall be required for adoption.



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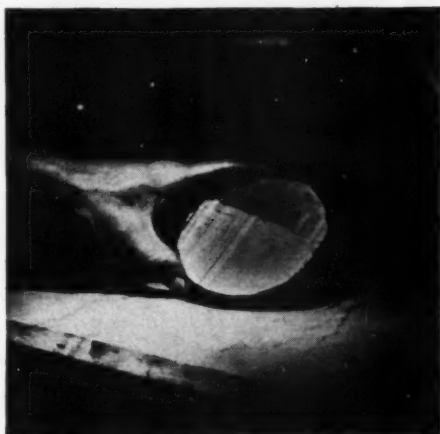
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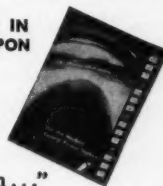
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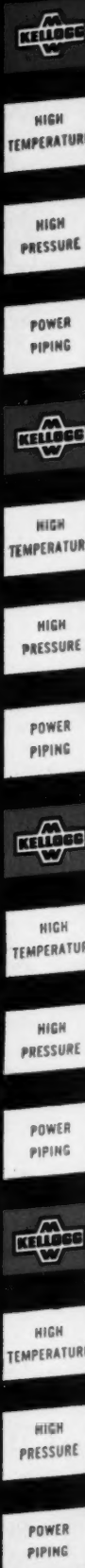


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How Western Society Serves Its Members

**Dr. Gustav Egloff, Past President
Western Society of Engineers
Universal Oil Products Company**

Presented before the Engineers Council for Professional Development.

The Western Society of Engineers, founded in 1869, was the fourth engineering Society to be established in the United States. Its first president was Col. Roswell B. Mason who was elected Mayor of Chicago in the same year and served in the latter capacity during the great fire of 1871. The Society's roster includes engineers from all branches of the profession. Although headquarters are in Chicago and most of its members reside in that area, the Society has non-resident members in every section of the United States and many foreign countries. It is unique among engineering societies and has much to offer engineers of all age brackets from students to men having long records of accomplishment.

The Western Society is so organized that it fulfills five fundamental needs of the engineering profession by encouraging the advancement of:

- (1) The theory and practice of engineering
- (2) The interests of the profession
- (3) The education of its members
- (4) The interests of the community
- (5) The interests of the employer

For the purpose of advancing the theory and practice of engineering, the

Society has ten sections, representing different interests, which meet to present and discuss technical subjects. There is at least one such meeting each week from October to June. The sections include:

- (1) Bridge and Structural Engineering
- (2) Chemical and Metallurgical Engineering
- (3) Communications Engineering
- (4) Electrical Engineering
- (5) Fire Protection and Safety Engineering
- (6) Gas, Fuels and Combustion Engineering
- (7) Hydraulic, Sanitary and Municipal Engineering
- (8) Mechanical Engineering
- (9) Traffic Engineering and City Planning
- (10) Transportation Engineering

The professional interests of Western Society members are served through many committees and the operations of four divisions: (1) Consulting Engineers (2) Engineering History (3) Junior Division and (4) Professional Women's Council. In a long term program for the advancement of engineering as a

profession, the Junior Division is of particular importance. This division stems from the recognition by the Society that it has a primary obligation to aid the young graduate in becoming adjusted to his position in the scheme of things. In the development of an engineering career, the value of a professional society cannot be overemphasized. An engineering society can offer the young graduate an opportunity both to keep his technical knowledge up-to-date and to make professional contacts. Participation in society activities also gives him a sense of belonging to the profession, and as a corollary, imbues him with a professional pride. The Junior Division of the Western Society is unusually worthwhile in this respect, inasmuch as it provides for greater opportunity for self-expression and for more active participation by the younger member than would otherwise be possible.

Professional interest must also be stimulated by good publications. The Western Society has such a medium in its official journal, the MIDWEST ENGINEER, which is published monthly. The articles included are concerned with subjects of broad engineering interest. News of Society activities keeps the members in close touch with the work going on. Future meetings are announced and past meetings are reported upon both pictorially and in print.

To provide incentives for creative work, WSE presents three awards: the Octave Chanute Medal to a member for a paper in the field of civil, mechanical or electrical engineering; the Charles Ellet Award, to a Junior Division member for an outstanding paper and the Annual Cash Award, open to all members and providing a maximum of five \$100 awards for winning papers submitted in the contest.

WSE also participates with the four Founder Societies in the Alfred Noble Prize for excellence of technical papers, and the Washington Award, which recognizes preeminent service in promoting the happiness, comfort and well-being of humanity.

The Western Society provides a direct service to its members in the formulation of programs for post-collegiate training. More often than not, engineers find that they must continue with some schooling in order to attain real success and recognition. For this purpose, the Educational Committee has worked with high-grade engineering schools in the Chicago area to make appropriate night classes available.

For some time the Western Society has sponsored a refresher course at the Extension Division of the University of Illinois to assist its members in preparing for the State Professional Engineering examinations, which are prerequisite to the granting of a Certificate of Registration.

New Educational Program

The criticism most often directed at engineers is that they know too much of engineering science, and mathematics, and too little of writing, speaking, economics and cultural subjects. The Society believes that the engineer must have an understanding of the contemporary world and its inhabitants in order to utilize his technical skill to the advantage of society and himself. He must be able to express his ideas to others and understand how these ideas fit into the general economic picture. It is indeed difficult for the engineer to acquire all of the background he needs in non-scientific studies during college. He has necessarily devoted a great portion of his time in school to an acquisition of knowledge of the natural laws which are

basic to his profession. For these reasons the Western Society is making it possible for the engineer to supplement his knowledge in other fields after leaving school.

The slogan for this new General Education Program is "Thinking, Reading, Speaking, Writing." Unless the engineer has developed these talents and can communicate his ideas in a coherent report to superiors and co-workers, they are not of much use to mankind or to his employer. The engineer as a business man must also carry on some correspondence and frequently write articles for technical publications. He often addresses technical meetings, and if he has civic interest truly at heart, will speak before lay groups to acquaint them with the part engineering plays in their lives. To prepare the engineer for these responsibilities, the Western Society with the cooperation of the Founder Societies is at present sponsoring courses in Human Relations in Management, Rapid Reading, Conference Leadership, Executive Training and Business Management.

The Western Society, industry and the profession recognize that young engineers entering the business world need a broadened objective to develop their own futures to the maximum and to bring to their specialized engineering work a better understanding of the field of engineering as a whole and its place in business generally.

The Western Society of Engineers, therefore, has planned to provide the young engineer with an opportunity to meet and discuss with other young engineers and mature engineers who have become established in their professions. This program is designed to expand the young engineer's knowledge of engineering in the major lines of business in the community.

Leaders in the fields of utility, oil, small businesses, railroads, steel, packing houses and heavy manufacturing have been scheduled to speak at the forums.

In addition to being scientifically sound, good engineering must fit into the general economic pattern, but not many engineers have had the time nor the inclination to take courses in economics during their formal education. After they have stumbled over a few problems in the workaday world, the

need for such background becomes evident. The Western Society will, therefore, sponsor two courses in economics, one general and the other in systems of political economy. Among the subjects included in the general course will be functions and processes of economic systems, population and natural resources, methods of financing, money standards and systems, the problem of business depressions, price structures, market control policies, the distribution of income, government financial policies and a study of capitalism and collectivism.

As the engineer makes professional advancement, he is very likely to become involved in labor relations problems. If he is well grounded in the past history of the labor movement and the present theories and practices, he stands a much better chance of coping with these problems. A course, which the Western Society plans to sponsor, will cover the development of the American labor movement, elements of collective bargaining, and a study of labor relations.

The engineer also needs to understand political science rather thoroughly, not only in the interest of being an all-around good citizen, but for the reason that many statutes have direct bearing on engineering work. Two political science courses will be offered. The first will cover the development of American political institutions and the second will be a study of the laws on engineering, property, and taxation.

Serves Civic Committee

The Western Society serves the civic interests of the community in a number of ways. The Civic committee keeps constant vigilance over civic affairs relevant to engineering. Examples of matters studied by the various subcommittees are civil service operations, registration laws, smoke abatement, building codes, and traffic problems. They are deeply concerned with all engineering problems which affect the health, operation and beauty of the city. As an engineering society of recognized high standing, Western is frequently asked to furnish members for committees of the city and state on public engineering problems. For example, a number of Western Society members are on the City Planning Commission. Members are also

working on the Sag-Calumet Navigation Project which is laying plans to make the Calumet river navigable for barges.

The activities of the Western Society are also of high value to the employer of engineers. Keeping in touch with technical advances and engineering activities is a must for any company that wishes to survive. Personal contacts made at the Society are tangible factors in increasing sales and maintaining business relations. Society participation also increases morale among engineering employees. All concerned benefit from the broadening influence of contact with leading engineers whom the employee meets at Western Society headquarters.

Every purpose of the Society is served by the new Western Society headquarters. It is one of the most outstanding projects in the progressive program of expanded service to the engineering and scientific professions. It is, furthermore, an important step toward the creation of an engineering and science center for the city of Chicago. These new quarters are appropriately located in the building adjacent to John Crerar Library which has an outstanding collection of technical information. Other scientific and technical groups are also locating in these buildings.

The quarters of the Western Society occupy three floors totalling about 15,000

square feet of space. The newly enlarged dining room, located on the fifth floor, seats around 300 people, and can be divided into units of various sizes to provide privacy. It is open five days a week for lunch and dinner and by special arrangement at other times. It accommodates the dinner meetings of a number of scientific and technical societies and other groups.

The sixth floor includes a check-room, two lounges, bar, two meeting rooms, WSE offices, and the following offices of other engineering groups: national office of the American Society of Lubricating Engineers, national office of the National Electronics Conference and the local section of the Institute of Radio Engineers, the midwest office of the American Society of Mechanical Engineers, and the Chicago office of the Engineering Societies Personnel Service.

The lounges are beautifully appointed and comfortable. They serve as a gathering place for groups who are holding dinners or programs in the quarters, and their central location makes them an ideal meeting place for engineers and their families. In short, the engineers of Chicago now have a home in the Loop.

On the floor above, an auditorium and other meeting rooms are provided. The auditorium is acoustically treated and well-lighted, is equipped with modern

public address and picture projection systems which permit varied and effective program presentation. It is indeed a far cry from the usual hotel banquet room where acoustics are poor and someone's head is constantly bobbing up between the screen and slide projector. There are 200 comfortable theater-type seats in the auditorium and seating capacity can be increased to 300 by using the adjoining room. Otherwise this room can be used separately by a second group having 100 or less in attendance. A small conference room, suitable for a group of 20, is also located on this floor.

At present, about 45 groups are making use of the headquarters facilities. Appropriate meeting places for these societies have been scarce and expensive, and the Western Society is pleased that it can offer such service to other societies on a cost basis.

The quarters of the Western Society of Engineers represents an outlay of about \$300,000 which was contributed by members, employers, and a number of industries.

The quarters offer complete facilities to all professional groups of the community, both large and small, and provide the professional people of Chicago with a meeting place where they may reap the full benefits of close association with each other.



Requirements for Membership in WSE

GRADE OF MEMBERSHIP	Years of Experience*	Other Qualifications	References	FEES AND DUES		
				Entrance Fees	Annual Dues	
					Res.	Non-Res.
Member.....	10**....	Detailed requirements are set forth on page 2 (See articles V, VI, and VII).	3 Members.....	\$20.00	\$20.00	\$13.50
Associate (First 7 yrs. in grade) ...	6.....			10.00	10.00	6.50
Associate (After 7 yrs. in grade) ...				.....	20.00	13.50
Associate (Transfer from student member)				None	10.00	6.50
Affiliate	2.....	Engineering Student in Col- lege of recognized standing.	Dean or Other School Authority	16.50	16.50	11.50
Student	Not Required			None	3.50	3.50

NOTES: ** Two of the 10 must have been in responsible charge.

* Graduation from an accredited engineering college is accepted as six years of experience.

HONOR AWARDS

The Society administers or participates in five honor awards having as their purpose the recognition of engineering accomplishment and an incentive to engineers and members of the Society to ex-

cel in preparing and presenting engineering papers. These awards are the Octave Chanute Medal established in 1901, the Washington Award in 1916, the Charles Ellet Award (for Junior Engineers) in

1929, the Alfred Noble Prize also in 1929, and the Cash Awards in 1950. A brief outline of the purpose and conditions of each of these awards together with a list of the respective recipients follows:

Octave Chanute Medal

Octave Chanute, during his term of office as president, presented the Society with a fund to provide medals as awards for the best papers in Civil, Mechanical and Electrical engineering presented before the Society during 1901. At the close of his administration in 1902, he do-

minated a much larger fund the revenue therefrom to be applied in awards for prizes for papers read before the Society, under such conditions as the Board of Direction might determine.

During the following years medals have been awarded in General, Civil, Mechanical and Electrical engineering. The present design of the

medal was adopted in 1913 and each medal bears the profile of Mr. Chanute on one side and on the obverse side the year of the award, the name of the recipient, the branch of engineering and the date on which the paper was presented.

The awards of the Chanute medal have been made as follows:

1901
W. D. Pence—Civil Engineering
J. H. Spengler—Civil Engineering
A. Bement—Mechanical Engineering
A. V. Abbott—Electrical Engineering

1902
J. W. Alvord—Civil Engineering
R. E. Milligan—Mechanical Engineering
E. B. Ellicott—Electrical Engineering

1903
A. Marston—Civil Engineering
Storm Bull—Mechanical Engineering
E. Gonzenbach—Electrical Engineering

1904
W. A. Shaw—Civil Engineering
A. Bement—Mechanical Engineering

1905
T. L. Condon—Civil Engineering
C. E. Sargent—Mechanical Engineering
C. H. Smoot—Electrical Engineering

1906
G. H. Bremner—Civil Engineering
W. L. Abbott—Mechanical Engineering
R. F. Schuchardt—Electrical Engineering

1907
F. E. Turneure—Civil Engineering
W. T. Ray and Henry Kreisinger—Mechanical Engineering
D. W. Roper—Electrical Engineering

1908
H. E. Horton—Civil Engineering
A. N. Talbot—Mechanical Engineering
Morgan Brooks—Electrical Engineering

1909
A. Bement—Civil Engineering
O. Chanute—Mechanical Engineering
R. H. Rice—Electrical Engineering

1910
C. K. Mohler—Civil Engineering
C. P. Berg—Mechanical Engineering
H. B. Gear—Electrical Engineering

1911
John Ericson—Civil Engineering
H. Gansslen—Mechanical Engineering
C. F. Burgess—Electrical Engineering

1912
Onward Bates—General Engineering
D. W. Mead—Civil Engineering
W. L. Abbott—Mechanical and Electrical Engineering

1913
O. H. Basquin—Civil Engineering
T. V. Salt—Mechanical Engineering

1914
Andrews Allen—General Engineering
Norman Stineman—Civil Engineering
Hymen Eli Goldberg—Mechanical Engineering

1915
Curtis McD. Townsend—General Engineering
Wilbur M. Wilson—Civil Engineering

1916
H. B. Sauerman—General Engineering
Clinton B. Stewart—Civil Engineering

1917
B. H. Peck—Electrical Engineering

1924
W. A. Shaw—General Engineering
John F. Hayford—Civil Engineering
Paul L. Battey—Mechanical Engineering

1935-37
W. M. Wilson—Civil Engineering
F. F. Fowle—Electrical Engineering

1937-38
Otto R. Jelinek—Civil Engineering
Earle G. Benson—Mechanical Engineering
J. Paul Clayton—Electrical Engineering

1938-39
Chas. B. Burdick—Civil Engineering
A. G. Shaver—Electrical Engineering

1939-40
Paul L. Battey—Civil Engineering
Gustav Egloff—Mechanical Engineering

1940-41
Lawrence T. Wyly—Civil Engineering
Charles W. Gennet, Jr.—Electrical Engineering

1941-42
Sholto M. Spears—Civil Engineering
Charles W. Larch—Electrical Engineering

1942-43
John B. Jackson—Electrical Engineering

1943-44
Robert L. Anderson—Civil Engineering
Frank F. Fowle—Mechanical Engineering

1944-45
Ovid W. Eshbach—General Engineering

1945-46
George C. Hillis—Communication Engineering

1946-47
Tenney S. Ford—Sanitary Engineering
Albert L. Tholin—Sanitary Engineering

1950-51
Charles E. DeLew—Civil Engineering

1951-52
Horace P. Ramsey—Civil Engineering

1953-54
John P. Clennon—Electrical Engineering

Washington Award

The late John W. Alvord, Past President W. S. E., in 1916 proposed the establishment of an honor award by the Society and donated a fund for its maintenance. The scope of the award was later enlarged and the name "Washington Award" adopted as a reminder that the first president was an engineer. The four "founder" engineering societies were invited to elect two representatives each to serve on the Commission of Award which also includes nine members to be selected by the Western Society of Engineers.

The purpose of the Award is the "recognition of devoted, unselfish and pre-eminent service in advancing human progress." It is conferred each year upon an engineer whose professional attainments, in the judgment of the commission, have pre-eminently advanced the welfare of mankind. Presentation of the award is made at a joint meeting of the members of the five participating societies.

The token of the Washington Award is a beautiful bronze tablet mounted on a marble

base and bearing an inscription reciting the purpose of the award, name of the recipient, the accomplishment for which it is given followed by the names of the participating societies.

Subsequent gifts by Mr. Alvord have increased the endowment to a substantial amount, enabling the award to be administered in a dignified manner. The Commission has adopted complete rules governing selection of candidates for the award and procedure in choosing the recipient. The names of the recipients and citations of the Award follow:

- 1919—Herbert C. Hoover, Hon. M. W. S. E., for his achievements as chairman, commission for relief of Belgium 1914-17, food administrator of the United States 1917-18.
- 1922—Robert W. Hunt, Hon. M. W. S. E., for his pioneer work in the development of the steel industry in the United States and for a life devoted to the advancement of the engineering profession.
- 1924—Arthur N. Talbot, Hon. M. W. S. E. for his life work as student and teacher, investigator and writer and for his enduring contribution to the science of engineering.
- 1925—Jonas Waldo Smith, for the rare combination of vision, technical skill, administrative ability and courageous leadership in engineering.
- 1926—John Watson Alvord, Past Pres. and Hon. M. W. S. E., for his pioneer work in developing the fundamental principles of public utility valuation and his marked contributions to sanitary science.
- 1927—Orville Wright, for fundamental scientific research and resultant successful airplane flight.
- 1928—Michael Idvorsky Pupin, for devotion to scientific research leading to his inventions which have materially aided the development of long distance telephone and radio broadcasting.
- 1929—Bion Joseph Arnold, Past President and Hon. M. W. S. E., for pioneering work in the engineering and economics of electrical transportation.
- 1930—Mortimer Elwyn Cooley, for vision and constructive leadership in the education of the engineer.
- 1931—Ralph Modjeski, Past President and Hon. M. W. S. E., for his contribution to transportation through superior skill and courage in bridge design and construction.
- 1932—William David Coolidge, for his scientific spirit and achievement in developing ductile tungsten and the modern x-ray tube.
- 1935—Ambrose Swasey, for his distinguished contributions as a builder of instruments, institutions and men.
- 1936—Charles Franklin Kettering, for his high achievements in guiding industrial research toward the greater comfort, happiness and safety of mankind in the home and on the highway.
- 1937—Frederick Gardner Cottrell, for his social vision in dedicating to the perpetuation of research the rewards of his achievements in science and engineering.
- 1938—Frank Baldwin Jewett, for inspiring and directing scientific research leading to improvements in the art of communication.
- 1939—Daniel Webster Mead, Hon. M. W. S. E., for his superior contribution to sound theory, good practice and high ethical standards in the creation of engineering works, as an engineer and as a teacher.
- 1940—Daniel Cowan Jackling, M. W. S. E., for pioneering in large-scale mining and treatment of low-grade copper ores, releasing vast resources from formerly worthless deposits.
- 1941—Ralph Budd, M. W. S. E., for vision and courageous leadership in advancing the technological frontiers of high speed railroad transportation.
- 1942—William Lamont Abbott, Past President and Honorary M. W. S. E., for advancing the standards of the engineering profession, for aiding combustion research.
- 1943—Andrey Abraham Potter, for distinguished leadership in engineering education and research and patriotic service in mobilizing technical knowledge for victory in war and peace.
- 1944—Henry Ford, for pioneer development of mass production of low cost automotive transportation which revolutionized the way of life of mankind.
- 1945—Arthur Holly Compton, Hon. M. W. S. E., for his research and teaching in the physical sciences, increasing man's knowledge of the action of x-rays and cosmic rays.
- 1946—Vannevar Bush, for outstanding leadership in organizing and directing scientific resources of the nation toward victory in World War II.
- 1947—Karl Taylor Compton, for progressive administration of engineering education for leadership in research and for advancement of American industry in technology.
- 1948—Ralph Edward Flanders, for high technical skill in perfecting the tools of industry and for distinguished service in the field of human relationships.
- 1949—John Lucian Savage, for unselfish public service devoted to the creation of monumental hydraulic structures utilizing natural resources.
- 1950—Wilfred Sykes, M.W.S.E., for invention of electrical machines and steel processes for advances in industrial administration and cooperation for counsel to state and college.
- 1951—Edwin Howard Armstrong, for outstanding inventions basic to radio transmission and reception, and notable service to his country.
- 1952—Henry Townley Heald, for distinguished leadership in engineering education in industrial technology in scientific research and in civic affairs.
- 1953—Gustav Egloff, M.W.S.E., for distinguished leadership in petroleum research and development in professional activities and in community services.
- 1954—Lillian Moller Gilbreth, for her outstanding contributions to engineering and scientific management for her unselfish devotion to the problems of the handicapped.

Alfred Noble Prize

The Alfred Noble Prize was established in 1929 and consists of an award from the income of a fund contributed by engineers and others to perpetuate the name and accomplishments of Alfred Noble, Past President of both the Western Society of Engineers and the American Society of Civil Engineers. The prize consists of a cash award, allowance for travel expense and a certificate

signed by the president and secretary of the American Society of Civil Engineers, which society is trustee of the fund.

The award is open to any member, not past his thirty-first birthday, of the Western Society or any of the four "founder" engineering societies and is given for a technical paper of particular merit on any subject accepted for publica-

tion by any of the foregoing five societies.

The recipient of the prize is selected annually by a committee composed of one representative from each of the five societies. The award is made at a general meeting of the society of which the recipient is a member.

The Alfred Noble Prize has been awarded as follows:

- 1931—C. T. Eddy (A. I. M. E.), for paper, "Arsenic Elimination in the Reverberatory Refining of Native Copper."
- 1932—Frank M. Starr (A. I. E. E.), for paper "Equivalent Circuits."
- 1933—Claude Maxwell Stanley, Jr. (A. S. C. E.), for paper "Study of Stilling—Basin Design."
- 1936—Abe Tilles (A. I. E. E.), for paper "Spark Lag of the Sphere Gap."
- 1937—G. M. L. Sommerman (A. I. E. E.), for Paper "Properties of Saturants for Paper-Insulated Cables."
- 1938—Ralph J. Schilthuis (A. I. M. E.), for paper "Connate Water in Oil and Gas Sands."
- 1939—Claude E. Shannon (A. I. E. E.) for paper "A Symbolic Analysis of Relay and Switching Circuits."

- 1941—Robert F. Hayes, Jr. (A. I. E. E.), for paper "Development of the Glow Switch."
- 1942—George W. Dunlap (A. I. E. E.), for paper "The Recovery Voltage Analyzer for Determination of Circuit Recovery Characteristics."
- 1943—Dr. Benjamin J. Lazan (A. S. M. E.), for paper "Some Mechanical Properties of Plastics and Metals Under Sustained Vibrations."
- 1944—W. R. Wilson (A. I. E. E.), for paper "Corona in Aircraft Electric Systems as a Function of Altitude."
- 1945—A. L. Ahlf (A. S. C. E.) for paper "Design Constants for Beams with Nonsymmetrical Straight Haunches."
- 1946—Martin Geland, Jr. (A. S. M. E.), for paper "The Flutter of a Uniform Cantilever Wing."

- 1947—John H. Hollomon (A. I. M. E.), for paper "The Mechanical Equation of State."
- 1948—Robert L. Hoss (A. I. M. E.), for paper "Calculated Effect of Pressure Maintenance on Oil Recovery."
- 1949—John C. Fisher (A. S. M. E.), for "Anisotropic Plastic Flow."
- 1950—Ralph J. Koshenburger (A.I.E.E.) for paper "A Frequency Response Method for Analyzing and Synthesizing Contractor Servomechanism."
- 1951—Eldo C. Koenig (A.I.E.E.), for paper "An Electric Analogue Computer Using the Photo Cell as a Nonlinear Element."
- 1952—Myron Tribus (A.S.M.E.), for paper "Intermittent Heating for Aircraft Ice Protection with Application to Propellers and Jet Engines."

Cash Awards

Beginning in 1950 the Western Society of Engineers established annual Cash Awards for the best papers submitted by members. Five prizes are authorized for distribution annually, each for \$100.

Winners are selected by an Awards Committee, which reserves the right to award less than the five established prizes or to postpone the competition if papers are not of sufficient merit. Any member of the Society, regardless of grade of membership, is eligible. Papers should be of general interest to engineers, but neither highly technical nor of controversial nature.

Winners of Cash Awards are:

- 1950**
C. J. McLean (1st prize)—"Measuring Circulating Water Flow by the Salt-Velocity Method."
Paul Rogers (2nd prize)—"The Structural Aspects of Power Plant Design."
Charles A. Blessing (3rd prize)—"Surveying and Mapping for Modern City Planning."
- 1951**
Albert L. Tholin (1st prize)—"Elevated Walkways for Downtown Chicago."
Ernest L. Abramson (2nd prize)—"The Turbine Type of Peripheral Pump."

- Erwin M. Lurie (3rd prize)—"Plaster Cracks—But When?"
- 1952**
Norman E. Brown—"Location of Industries in Chicago and Northern Illinois."
James A. Stewart—"Traffic Engineering Design of Dial Telephone Exchanges."
- 1953**
Lillian Stemp—"The Engineer and the Prospective Employer."
- 1954**
No papers qualified for regular Cash Awards. Honorable mention and token award given to authors of five papers.

Charles Ellet Award

This award was established in 1929 by a gift from E. C. Shuman, a Junior member, who suggested the name "Charles Ellet Award" as a memorial to that young engineer of Civil War days whose undaunted determination to succeed in the face of overwhelming disappointments outlived the struggle for recognition.

The award is symbolized by a beautiful loving cup on which is engraved, the name of the recipient and the names of their schools. The cup

is on display in the Society's headquarters. As evidence of the honor bestowed, the winner receives an engraved certificate and a prize of \$25.

The award is made periodically to a member under 30 years old, who, in the opinion of a committee of awards, is adjudged to have excelled in the preparation and presentation of a technical paper presented in competition for this award at a meeting of the Junior Engineers.

The recipients of this honor have been:

- 1930—John D. Burlie—Purdue University.
- 1932—Francis E. Woloszewick—Armour '27.
- 1933—Joseph Kucho.
- 1934—Irving J. Kadic—Chicago Tech. '27.
- 1935—Grover C. Lewis—Illinois '30.
- 1936—Robert W. Suman—Armour '34.
- 1937—George A. Nelson—Armour '35.
- 1939—Raymond V. McGrath—Univ. of Washington '35.
- 1940—Ray F. Erickson.
- 1950—Donald R. Klusman—Washington University, '48.

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John F. Sullivan, Jr., is manager of construction, Commonwealth Edison Co., and Public Service Co. of Northern Illinois. After receiving his engineering degree from the University of Wisconsin, Mr. Sullivan worked with General Electric Co., and then joined the Edison company in 1925.

Mr. Sullivan joined the Western Society of Engineers in 1928. He is a past-president of the Illinois Engineering Council and a member of the American Society

of Mechanical Engineers, and the Illinois and National Societies of Professional Engineers. Mr. Sullivan has been and is now a member of the Mechanical section of WSE, and has served as Treasurer of the Society.

ALBERT P. BOYSEN First Vice President

Albert P. Boysen is division engineer of the American Bridge Division of the United States Steel Corp. He started his career with the American Bridge Co. He secured his engineering education at night attending the Armour Institute of Technology.

Mr. Boysen joined the Western Society of Engineers in 1931. He has been chairman of the General Program Committee and the Bridge and Structural Engineering Section, and a member of the Admissions Committee.



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George L. Jackson
Second Vice President

George L. Jackson is Chief Engineer of the Illinois State Toll Highway Commission. After receiving an engineering degree from Purdue University in 1926, Mr. Jackson worked with the Sanitary District of Chicago, the City of Chicago and the Illinois Division of Highways.

Mr. Jackson joined the Western Society of Engineers in 1928. He has served successively as Chairman of the Hydraulic Sanitary and Municipal Section and the Awards, Admissions and Development Committees. At the present time he is a member of the Traffic Engineering and City Planning Section. He is also a member of the American Society of Civil Engineers.



J. EARL HARRINGTON
Executive Secretary

Mr. Harrington was graduated from Illinois Institute of Technology with a B.S. in Chemical Engineering. In 1939 he received the professional degree of Ch. E. from the same school. He was engaged for 12 years as Chemical Engineer and Engineer of Tests for the Bureau of Engineering of the City of Chicago. At the start of World War II he was called to Washington as Engineering Coordinator and Consultant to the Quartermaster General—and later was appointed Chief of the High Explosives Manufacturing and Raw Materials Divisions of the Explosives Branch of the Ordnance Department.

Mr. Harrington is also Vice-President of the National Council of Engineering Societies' Secretaries and Illinois Chairman of vocational guidance for the Engineers' Council for Professional Development. He joined Western Society in 1937.

1954-55

William R. Marston
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W. R. Marston was graduated from the University of Illinois with a B.S. degree in Railway Electrical Engineering in 1931. He subsequently became a staff engineer for the Chicago Surface Lines. He remained with that organization until 1942 when he was employed by the Office of Price Administration as a business analyst. In 1943 he was placed in charge of a transportation unit of the Mileage Rationing Branch of O.P.A.

Entering the Naval Reserve in 1943, Mr. Marston served in the Southwest Pacific.

In 1950 he associated himself with the City of Chicago as deputy city traffic engineer.

He joined the Western Society of Engineers in 1936, and served as a trustee, from 1951 to 1954.

He is president of Illinois Engineering Council.



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(Continued from Page 15)

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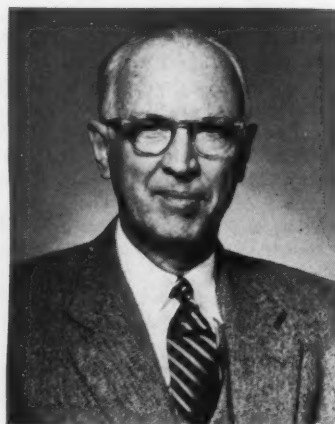


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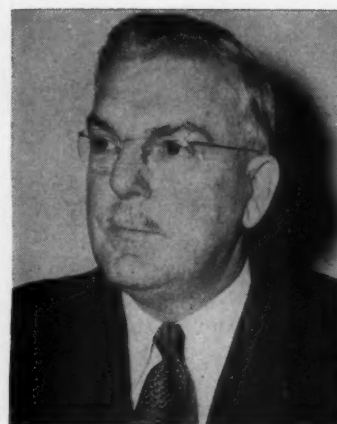


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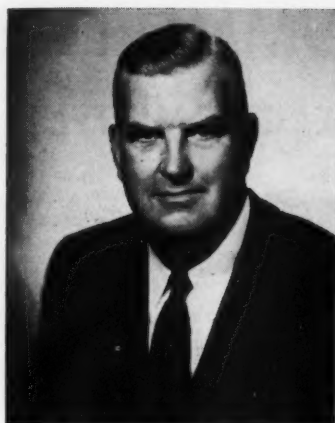
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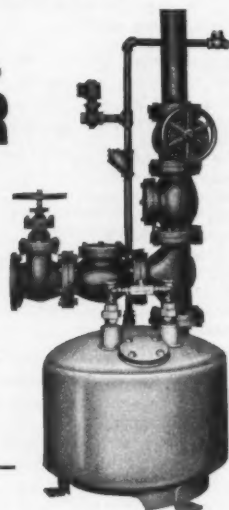
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The Story Behind the Society's Seal



Although all members of the Western Society of Engineers have seen the Society's Seal countless times, perhaps few of the new ones—and some of the old ones—know the interesting background of how the Seal came about and what it stands for.

The story of our Seal begins on March 7, 1882, when Vice President D. C. Cregier appointed a three-man committee to seek designs from among W.S.E.'s membership. Slightly more than two months later, this committee was able to report that it had selected the design submitted by G. A. M. Liljencrantz as the most appropriate one and that it had been approved by the Trustees. The very speed with which the Seal was designed and approved indicates that even in its early days our Society got things done rapidly.

The committee then asked Mr. Liljencrantz to prepare a detailed description of his design. Here is what he wrote:

"It has been the aim of the designer to indicate by appropriate emblems, as far as space and other circumstances would allow, the different branches of engineering represented in the Society, and some of the fundamental branches on which the manifold works of our profession are based.

"Thus, the suspension bridge, the sounding party, and 'Polaris,' the guiding star for those who seek the true meridian, and its assistant, the 'Dipper,' are emblematical of the Civil Engineers. The Mining Engineers are represented by some of their working tools, the sledge, the pick and the drill; while the castle and the cogwheel are the universally adopted emblems of the Military and Mechanical Engineers, respectively.

"These several designs are inclosed in the four fields produced by the construction of the famous 47th problem of Euclid, probably the most prominent and useful problem in geometry, wherefore this has been deemed the most appropriate representative of that important branch of science.

"Algebra and higher mathematics, the calculus, are also represented by well known signs pertaining to these branches.

"Finally, the motto, 'Per ardua ad metam,' which translated means, 'Through Difficulties to the Aim,' intended to indicate the universal purpose of all the different branches of the engineering profession, has been given in Latin, not to intimate thereby that this is the language with which the representatives of our profession are most familiar, but in the first place to get a comprehensive expression in a most condensed form; secondly, to make it more professional in appearance and, finally, because, if I am permitted to use a common phrase, 'They all do it.'"

CODE OF ETHICS

Formulated by the Engineers' Council for Professional Development, and adopted by the Board of Direction of the Western Society of Engineers, November, 1948.

Also adopted by the following national societies:

American Institute of Consulting Engineers, American Institute of Electrical Engineers, American Institute of Industrial Engineers, American Society of Civil Engineers, American Society for Engineering Education, American Society of Mechanical Engineers, as well as many local organizations in various cities and states.

Honesty, justice and courtesy form a moral philosophy which, associated with mutual interest among men, constitutes the foundation of ethics. The engineer should recognize such a standard, not in passive observance, but as a set of dynamic principles guiding his conduct and way of life. It is his duty to practice his profession according to these Canons of Ethics.

As the keystone of professional conduct is integrity, the engineer will discharge his duties with fidelity to the public, his employees and clients, and with fairness and impartiality to all. It is his duty to interest himself in public welfare, and to be ready to apply his special knowledge for the benefit of mankind. He should uphold the honor and dignity of his profession and avoid association with any enterprise of questionable character. In his dealings with fellow engineers he should be fair and tolerant.

Professional Life

SEC. 1. The engineer will cooperate in extending the effectiveness of his engineering profession by interchanging information and experience with other engineers and students and by contributing to the work of engineering societies, schools and the scientific and engineering press.

SEC. 2. He will not advertise his work or merit in a self-laudatory manner, and he will avoid all conduct or practice likely to discredit or do injury to the dignity and honor of his profession.

Relations with the Public

SEC. 3. The engineer will endeavor to extend public knowledge of engineering, and will discourage the spreading of untrue, unfair and exaggerated statements regarding engineering.

SEC. 4. He will have due regard for the safety of life and health of public and employees who may be affected by the work for which he is responsible.

SEC. 5. He will express an opinion only when it is founded on adequate knowledge and honest conviction while he is serving as a witness before a court, commission or other tribunal.

SEC. 6. He will not issue ex parte statements, criticisms or arguments on matters connected with public policy which are inspired or paid for by private interests, unless he indicates on whose behalf he is making the statement.

SEC. 7. He will refrain from expressing publicly an opinion on an engineering subject unless he is informed as to the facts relating thereto.

Relations with Clients and Employers

SEC. 8. The engineer will act in professional matters for each client or employer as a faithful agent or trustee.

SEC. 9. He will act with fairness and justice between his client or employer and the contractor when dealing with contracts.

SEC. 10. He will make his status clear to his client or employer before undertaking an engagement if he may be called upon to decide on the use of inventions, apparatus, or any other thing in which he may have a financial interest.

SEC. 11. He will guard against conditions that are dangerous or threatening to life, limb or property on work for which he is responsible, or if he is not responsible, will promptly call such

conditions to the attention of those who are responsible.

SEC. 12. He will present clearly the consequences to be expected from deviation proposed if his engineering judgment is overruled by non-technical authority in cases where he is responsible for the technical adequacy of engineering work.

SEC. 13. He will engage, or advise his client or employer to engage, and he will cooperate with other experts and specialists whenever the client's or employer's interests are best served by such service.

SEC. 14. He will disclose no information concerning the business affairs or technical processes of clients or employers without their consent.

SEC. 15. He will not accept compensation, financial or otherwise, from more than one interested party for the same service, or for services pertaining to the same work, without the consent of all interested parties.

SEC. 16. He will not accept commissions or allowances, directly or indirectly, from contractors or other parties dealing with his client or employer in connection with work for which he is responsible.

SEC. 17. He will not be financially interested in the bids as or of a contractor on competitive work for which he is employed as an engineer unless he has the consent of his client or employer.

SEC. 18. He will promptly disclose to his client or employer any interest in a business which may compete with or affect the business of his client or employer. He will not allow an interest in any business to affect his decision regarding engineering work for which he is employed, or which he may be called upon to perform.

Relations with Engineers

SEC. 19. The engineer will endeavor to protect the engineering profession collectively and individually from misrepresentation and misunderstanding.

SEC. 20. He will take care that credit for engineering work is given to those to whom credit is properly due.

SEC. 21. He will uphold the principle of appropriate and adequate compensation for those engaged in engineering work, including those in subordinate capacities, as being in the public interest and maintaining the standards of the profession.

SEC. 22. He will endeavor to provide opportunity for the professional development and advancement of engineers in his employ.

SEC. 23. He will not directly or indirectly injure the professional reputation, prospects or practice of another engineer. However, if he considers that an engineer is guilty of unethical, illegal or unfair practice, he will present the information to the proper authority for action.

SEC. 24. He will exercise due restraint in criticizing another engineer's work in public, recognizing the fact that the engineering societies and the engineering press provide the proper forum for technical discussions and criticism.

SEC. 25. He will not try to supplant another engineer in a particular employment after becoming aware that definite steps have been taken toward the other's employment.

SEC. 26. He will not compete with another engineer on the basis of charges for work by underbidding, through reducing his normal fees after having been informed of the charges named by the other.

SEC. 27. He will not use the advantages of a salaried position to compete unfairly with another engineer.

SEC. 28. He will not become associated in responsibility for work with engineers who do not conform to ethical practices.

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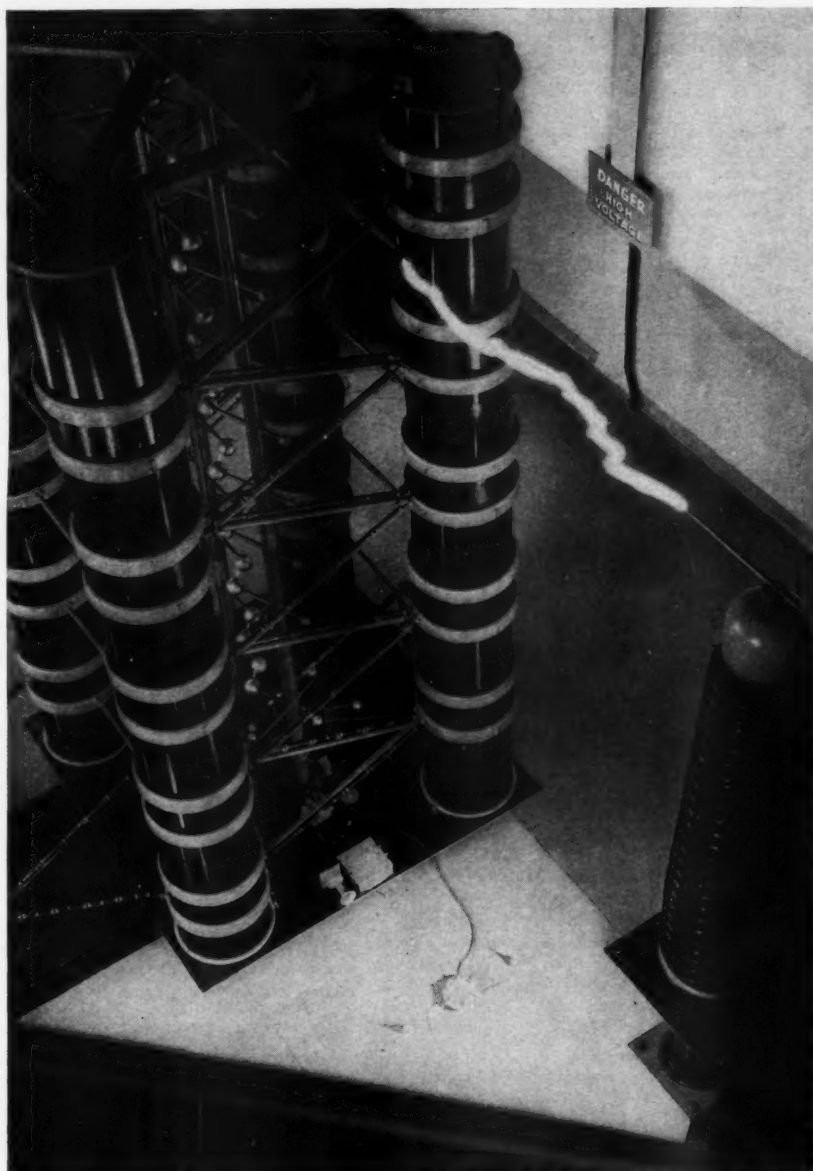
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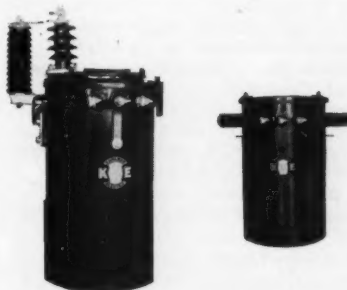
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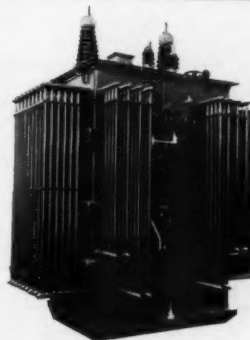


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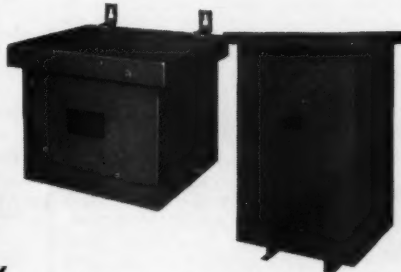
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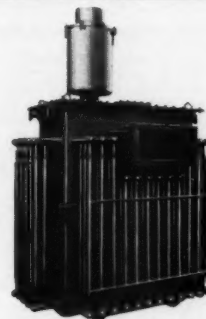
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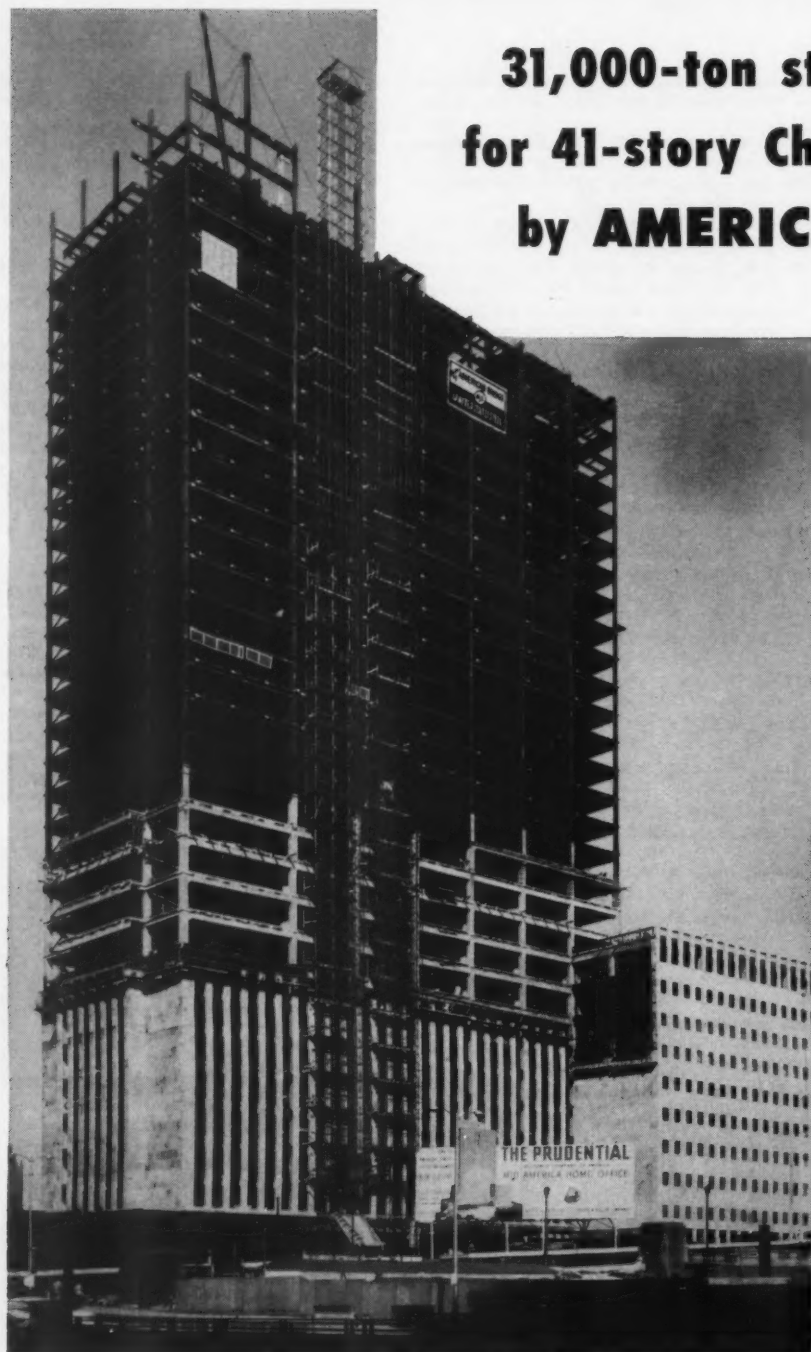
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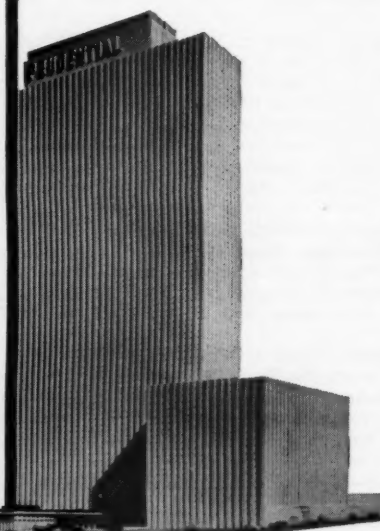
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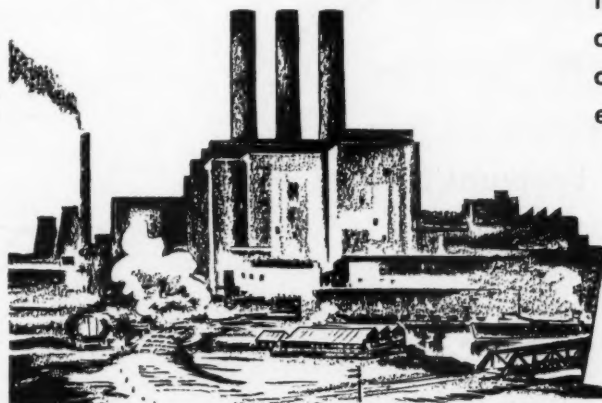
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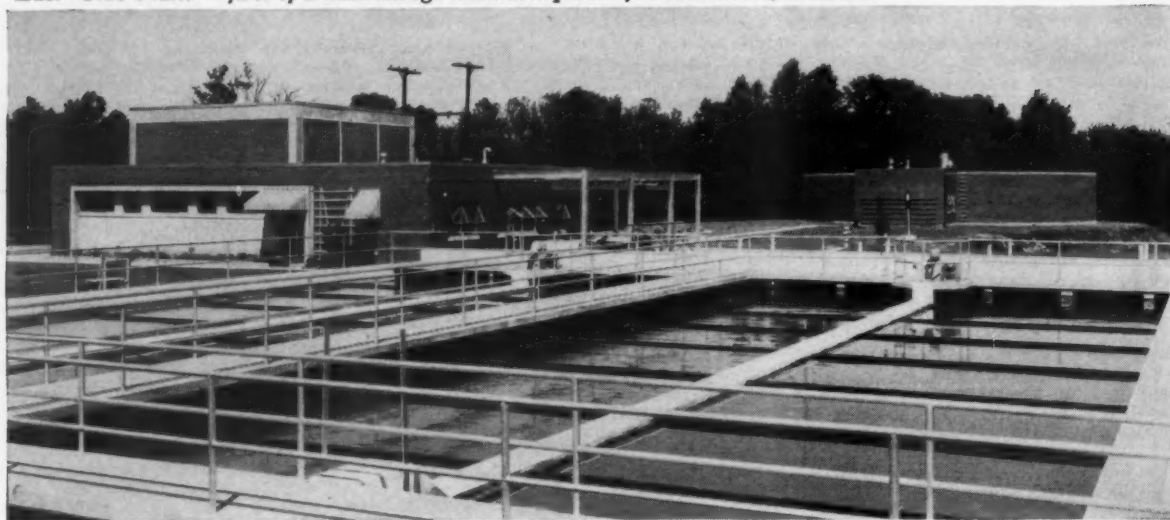
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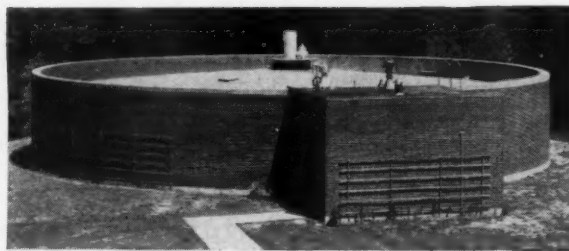
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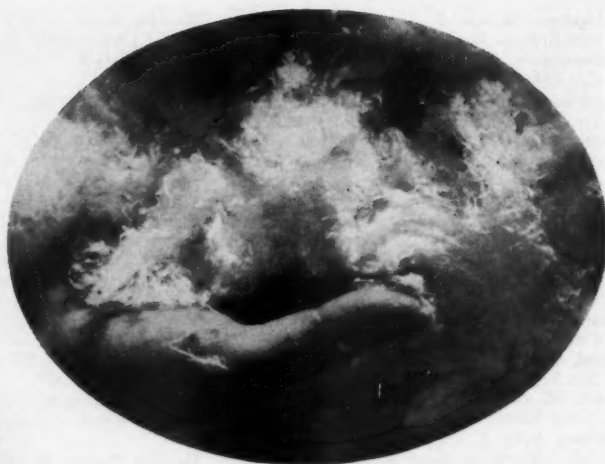
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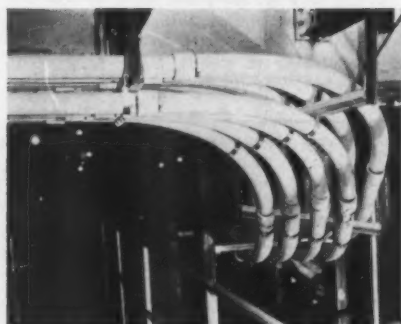
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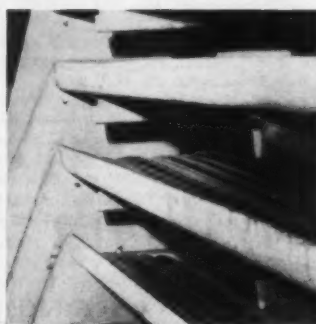
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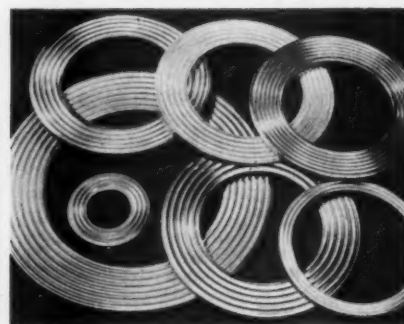
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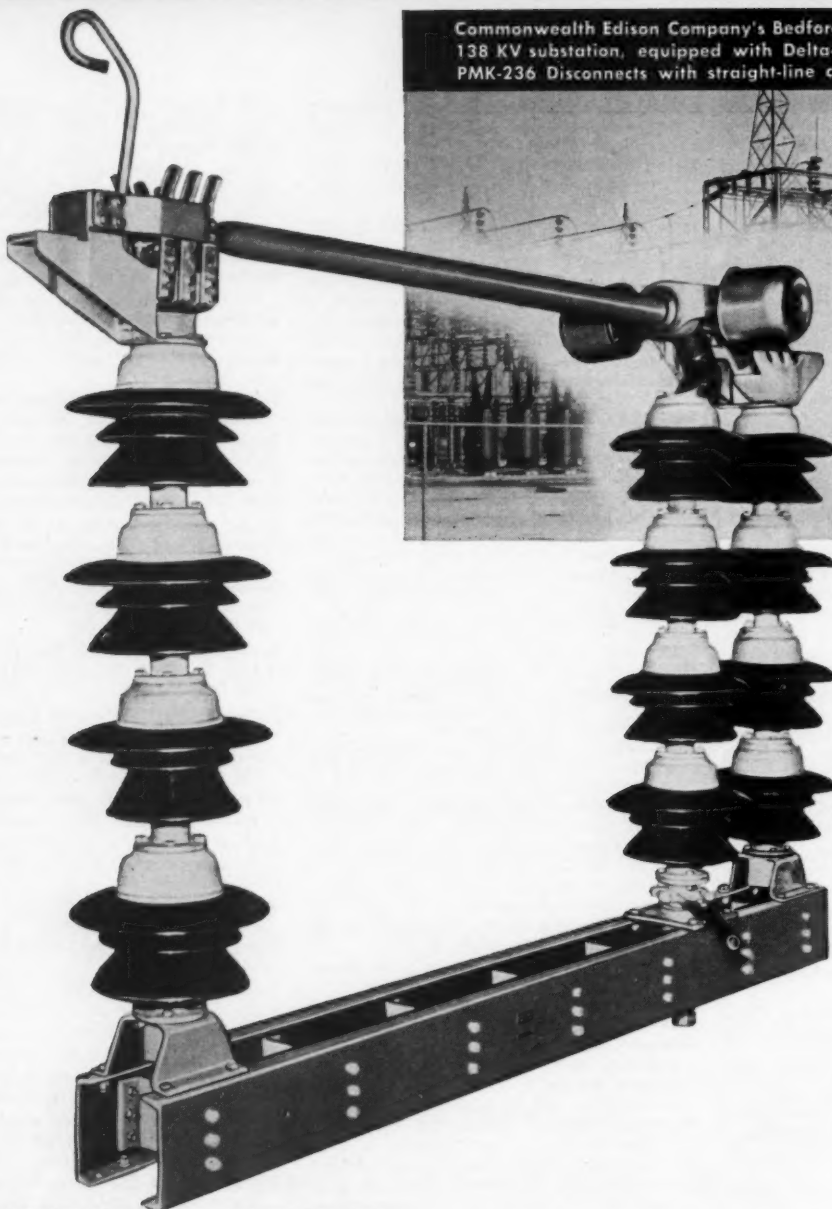
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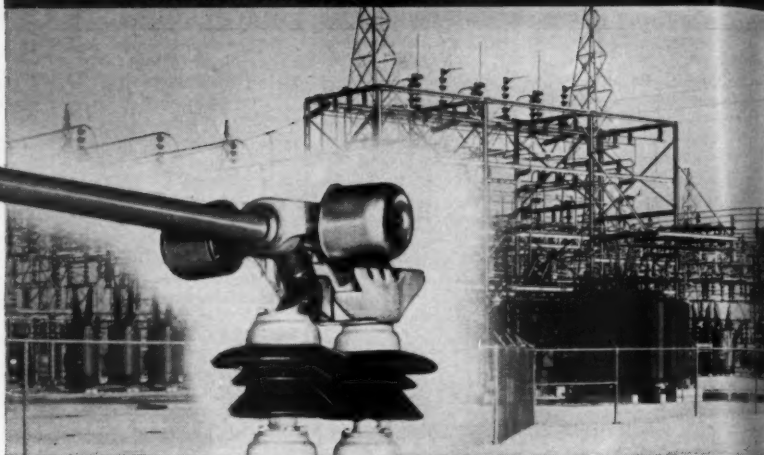
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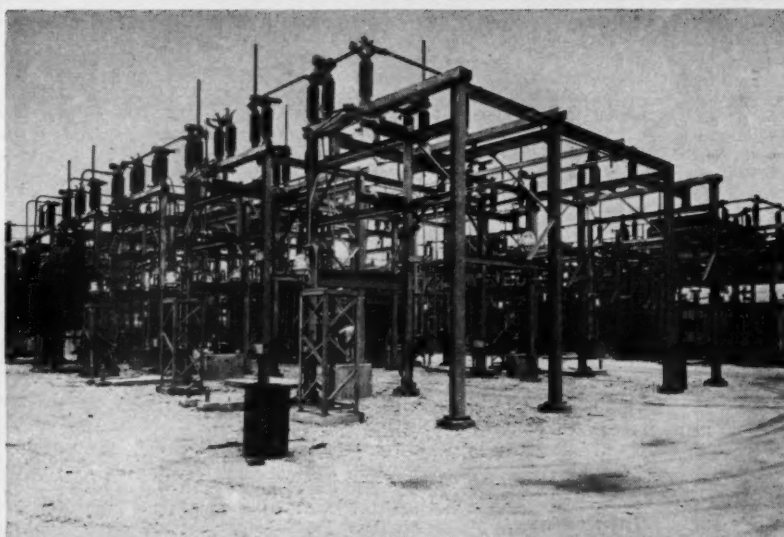
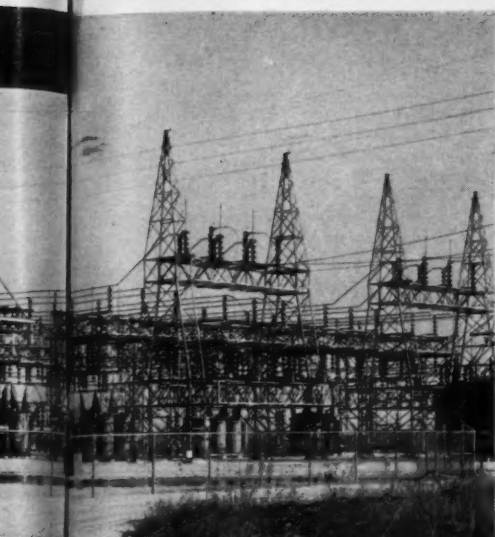
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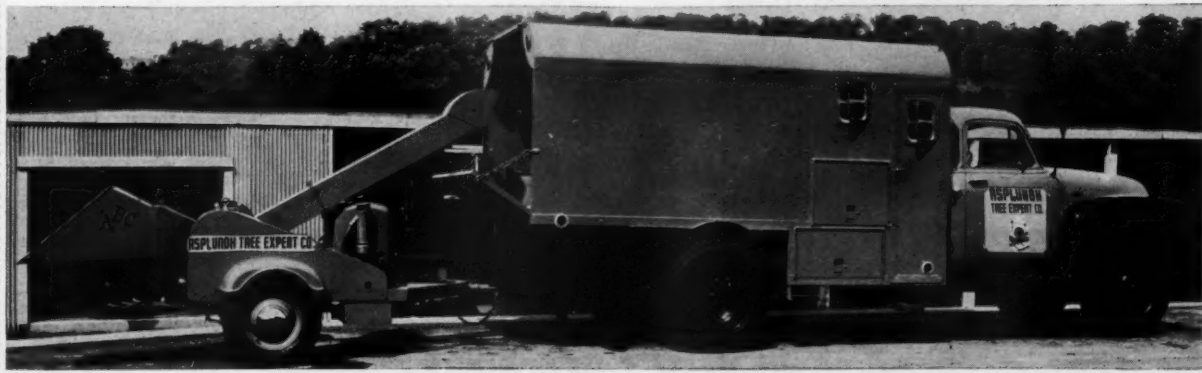
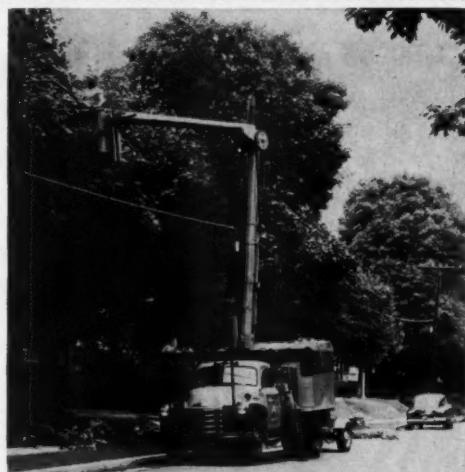
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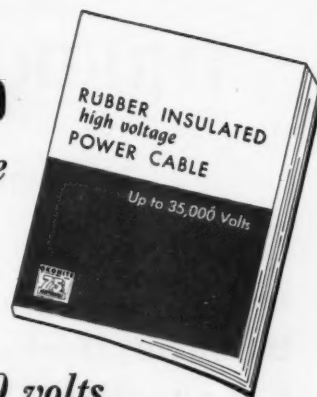
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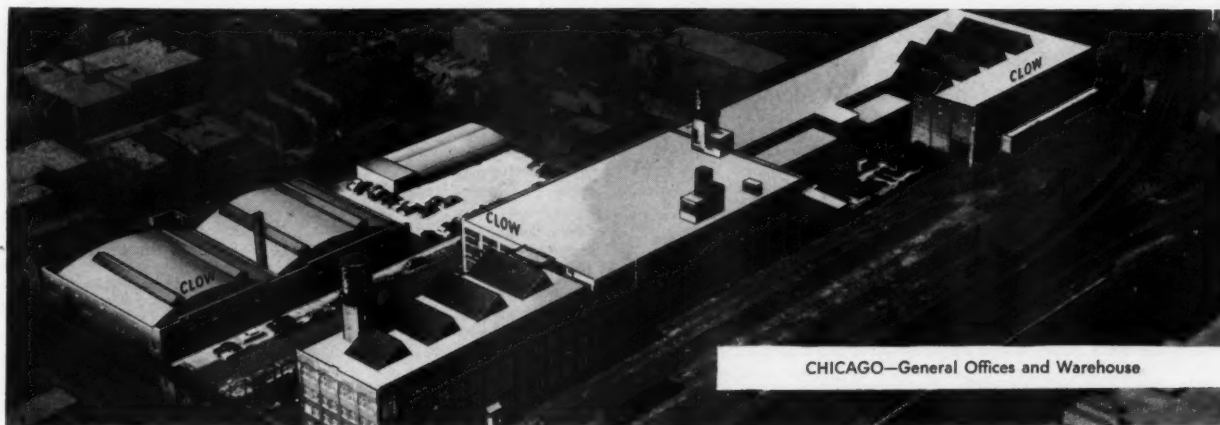
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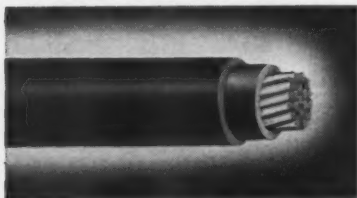


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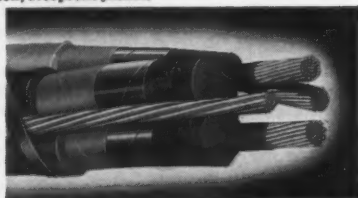
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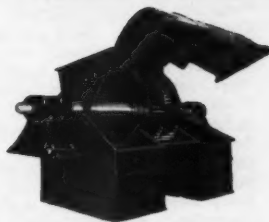
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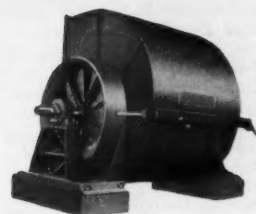
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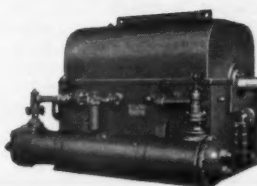


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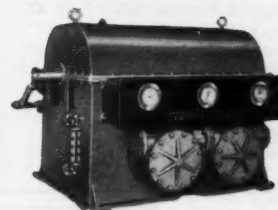


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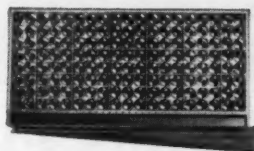


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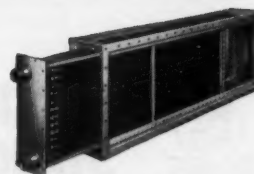
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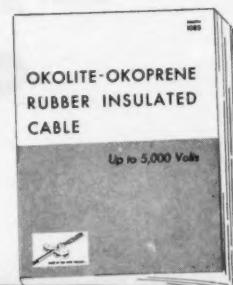
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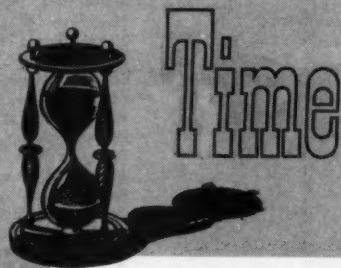
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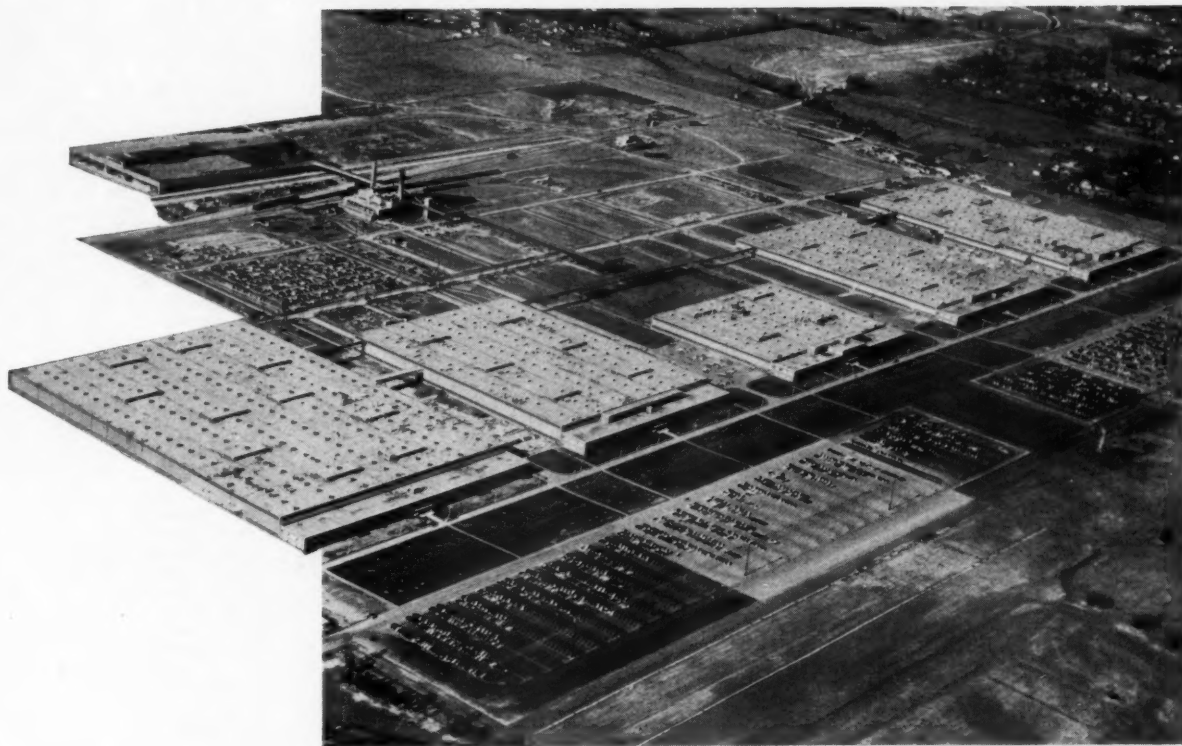
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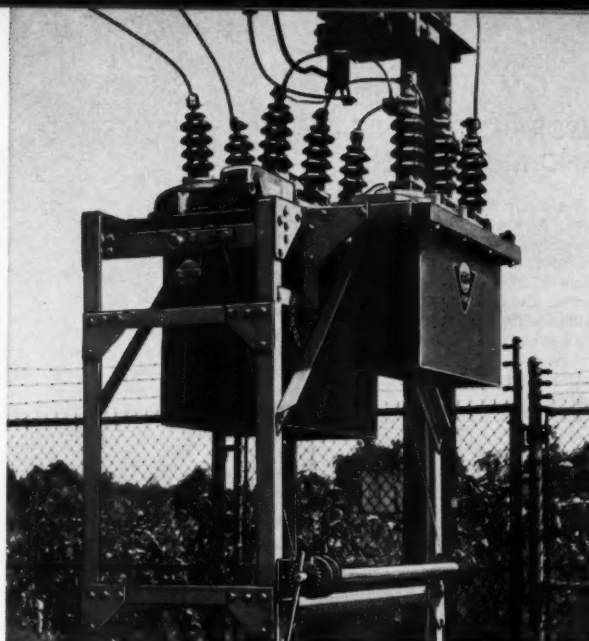
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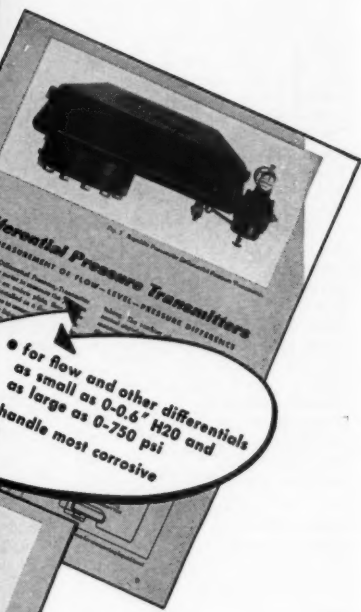
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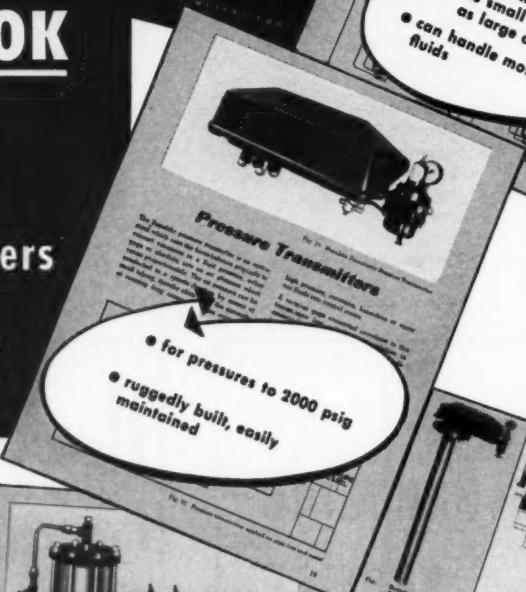
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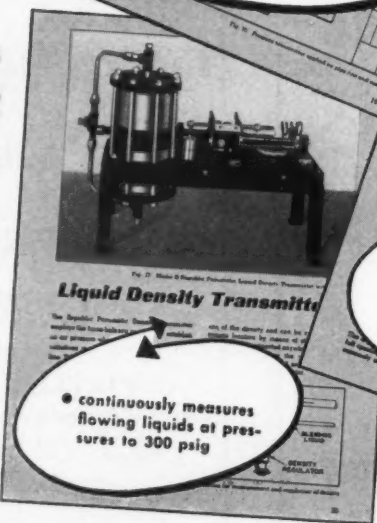
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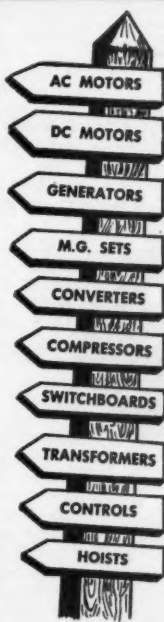
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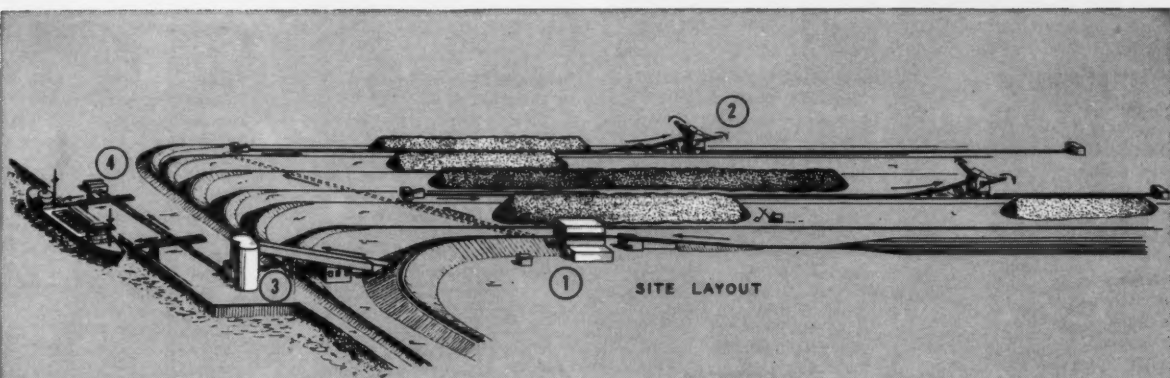
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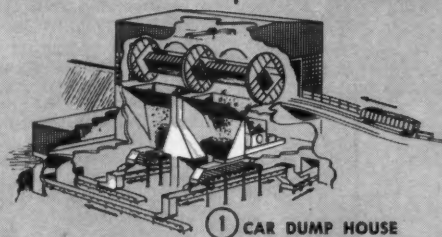
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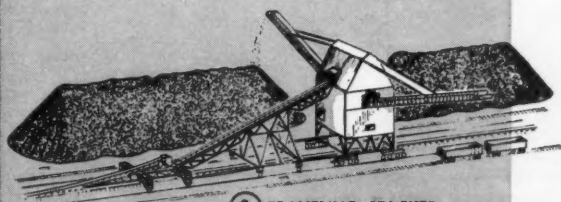
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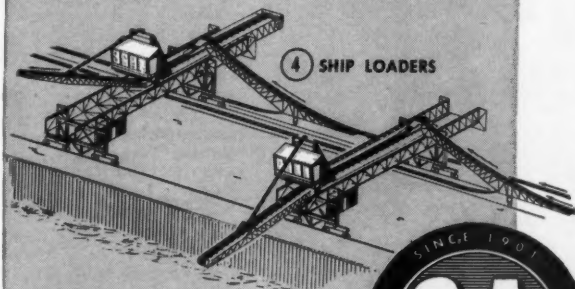


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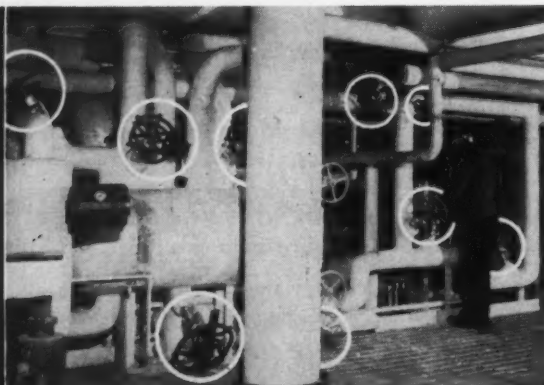
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For every condition of motor operation. Line extends from small manual starters for fractional motor control to giant starters used in controlling 2300 to 5000-volt motors.



Blowers

Single-stage centrifugal blowers up to 7 psig, 1400 to 60,000 cfm. Multi-stage, pressures to 2500 psig, 1000 to 100,000 cfm per unit. Axial blowers to 1,000,000 cfm.



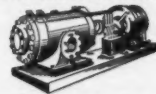
Rectifiers

Highly efficient conversion of ac to dc power. Require no special foundations. Can be placed at load center. Available in sealed and pumped-tube types.



Electronic Heaters

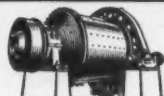
Brazing, soldering, hardening, annealing — one induction heater does all four jobs. Sizes 10 kw to 100 kw. Dielectric heaters available in sizes 3 kw and larger.



Compressors

Vibration-free rotary units. Single-stage, 5 to 50 psig, 49 to 3245 cfm. Two-stage, 60 to 125 psig, 250 to 1807 cfm. Also vacuum pumps for vacuums up to 29.9 inches Hg.

Mining and Processing Machinery



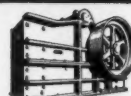
Grinding Mills

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Gyratory Crushers

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Jaw Crushers

For primary crushing of blocky and abrasive materials. Long, deep crushing chamber affords large capacity and uniform plate wear, minimizes slippage. Available in four types.



Vibrating Screens

Available in five basic types in sizes and modifications for any screening operation—scalping, dry and moist sizing, dewatering, rinsing, sink-float process, media recovery.



Rotary Kilns

Standard sizes range from 5 by 80 to 12 by 500 feet. Special sizes to meet any application. All-welded construction. Patented heat-recuperating system cuts fuel costs.



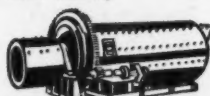
Hammermills

Impact crusher for primary breaking of soft materials or for reduction of non-abrasive rock and similar feed. Six sizes available — capacities 2 1/2 to 125 tph.



Chemical Milling

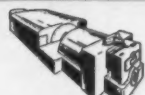
Line includes roller and compacting mills, free-swinging and small gyratory sifters (shown), dryers and coolers, packers, purifiers, plus complementary equipment.



Washing Equipment

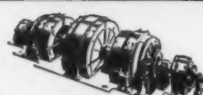
Allis-Chalmers offers six different types of washing equipment — blade mills (shown), revolving scrubbers, screen washers, log washers, rotary scrubber screens, vibrating screens.

Power Generation and Distribution Equipment



Steam Turbines

Built in all practical sizes in condensing, non-condensing and automatic extraction types. NEMA ratings 2000 kw and larger. Allis-Chalmers also builds surface condensers and air ejectors.



M-G Sets

Standard motor-generator sets in ratings 1 kw and larger. Special purpose types for hoist service, as frequency changers, balancers, boosters, and equalizing sets.



Transformers

For any power distribution problem. Power — 500 kva to largest; Distribution — to 500 kva; Load Center—100 to 2000 kva; Furnace and Instrument transformers also available.



Circuit Breakers

Oil types for switching capacity from 5 kv and 50,000 kva, to largest. Three types of air breakers cover range from 600 volts and 25,000 kva to 15,000 volts and 500,000 kva.



Switchgear

Indoor and outdoor in three types of cubicles and three breaker types. Special units built to suit needs. From 15,000 kva to 500,000 kva I. C.



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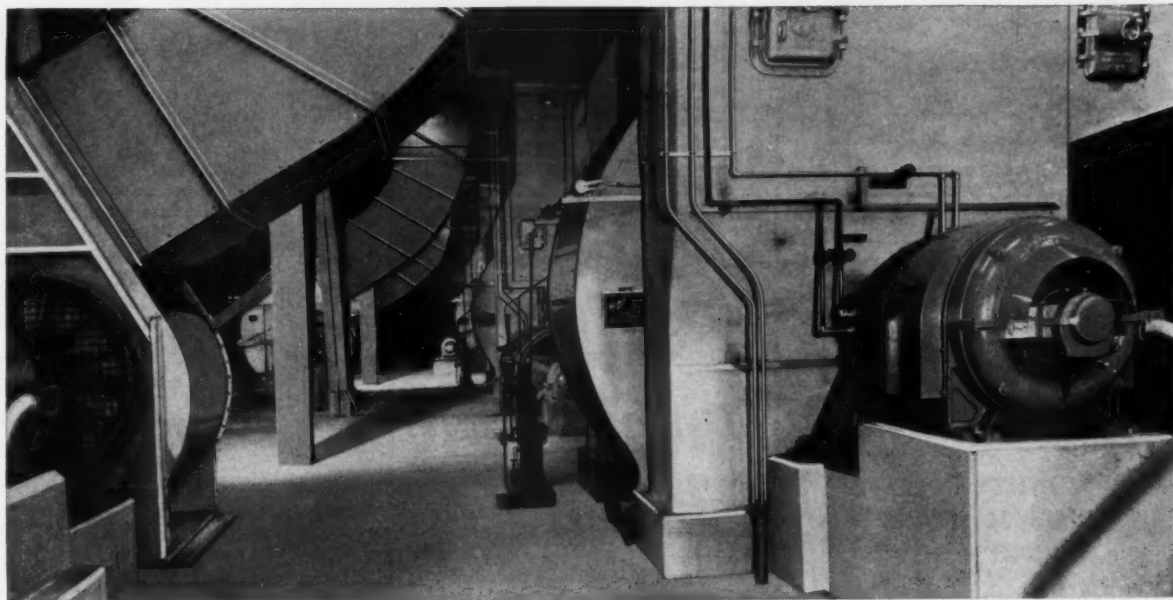
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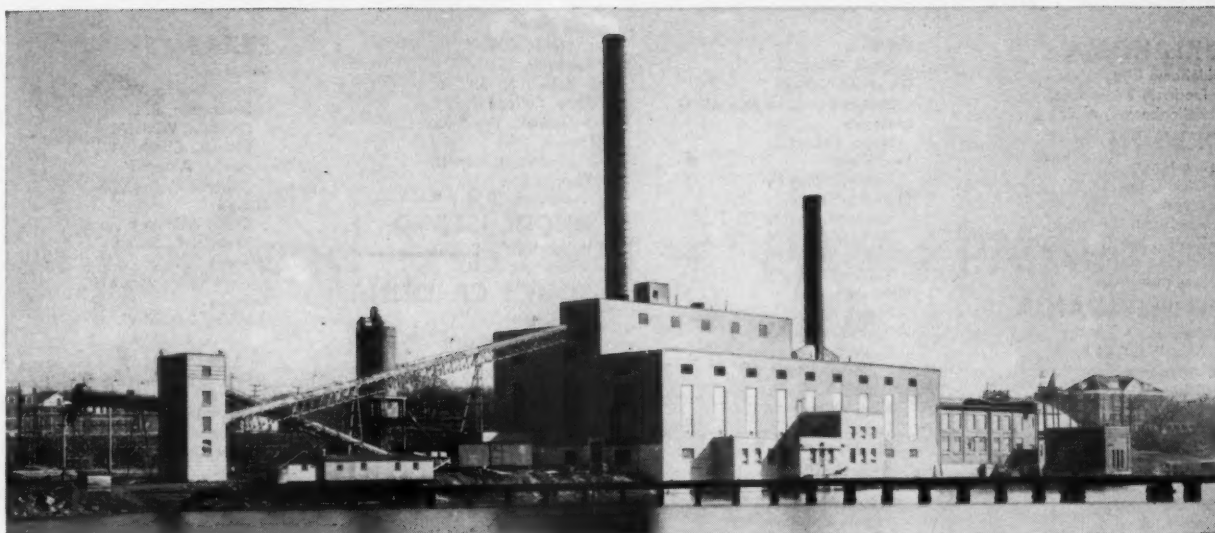
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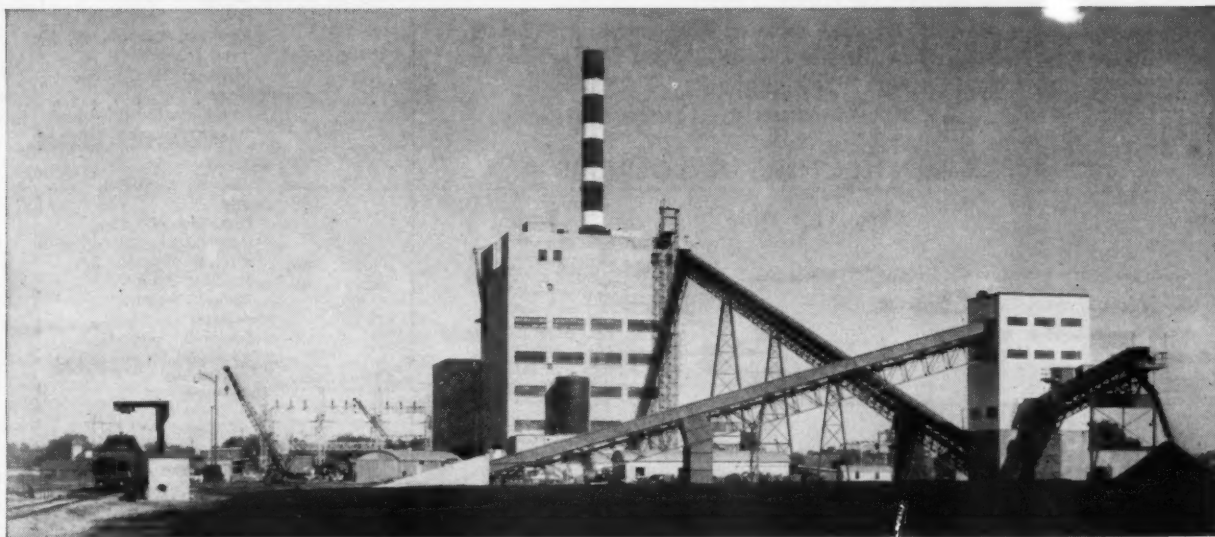
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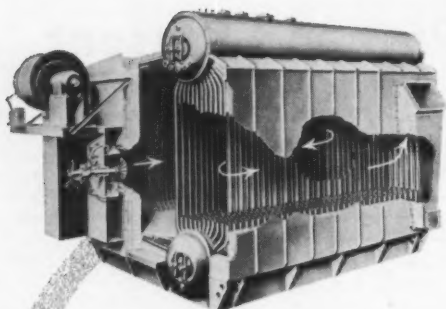
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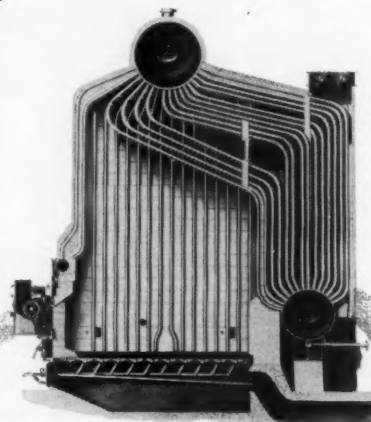
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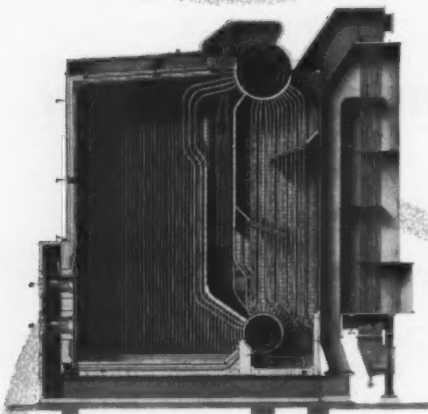
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Felt, C. F. W.		1920-21					
Ferguson, William B.						1952-53	
Field, H. H.						1931-33	
Finley, Wm. H.	1902-03	1901-02	1900-01				
FitzSimmons, Chas.					1880-87	1889-92	
Fowle, F. F.	1935-36	1922-23	1921-22		1920-21		

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Fowler, M. M.	1940-41	1939-40	1926-27	1923-26
Fox, E. Gordon	1938-39
French, W. M. R.	1875-78*
Garcia, John A.	1928-29	1927-28	1926-27	1925-26	.....	.....	.....
Gayton, L. D. ....	.....	.....	.....	.....	.....	1932-34	.....
Gear, Harry B.	1933-34	1932-33	1930-32	.....	.....	.....	.....
Gebhardt, G. F. ....	.....	.....	.....	1914-15	.....	.....	.....
Gerber, Emil .....	.....	.....	.....	.....	1896-98	.....	.....
Glaever, J. G.	1912-15
Gnaedinger, John P.	1954-
Goldmark, Henry	1896
Gordon, Bruce A.	1952-

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Gordon, Bruce A.						1952—	
Gordon, F. G.	1942—43	1941—42	1940—41		1937—38	1934—37	
Goss, W. F. M.				1909—10			
Gottlieb, A.	1888—89					1886—89	
Grant, B. E.	1916—17	1914—15	1901—02 1913—14			1903—06	
Greeley, S. S.		1883—84				1875—80* 1880—83	
Green, O. B.						1888—91	
Grinter, L. E.						1950—	
Hall, Ferd.						1897—00	
Hammond, Robert S.						1953—	
Hand, Geo. W.					1923—28	1928—30	
Hansen, Paul.						1943—44	
Harger, Kendrick.						1940—43	
Harper, R. B.			1945			1942—45	
Harrington, J. Earl.							1949—
Hart, G. A.						1920—21	
Hatch, J. N.		1918—19	1917—18				
Hatt, W. K.				1910—11			
Haupt, C. W.					1934—36		
Hayford, J. F.				1913—14			
Heald, H. T.	1945—46	1944—45	1943—44			1939—42	
Hecht, J. L.	1922—23	1921—22	1920—21	1919—20			
Herr, Hiero.	1894—95		1893—94				
Hess, F. A.						1952—	
Hjortberg, Max.						1869—74*	
Horton, Horace E.	1895—96					1896—99	
Hotchkiss, C. W.		1904—05				1901—04	
Howson, E. T.	1924—25	1923—24		1922—23		1919—22	
Howson, A. W.						1950—53	

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Hawson, L. R.	1937-38	1936-37	1935-36	1933-35
Hudson, C. H.		1886-87
Hunt, Robert W.	1893-94	1894-97
Huntington, W. C. ....		.....	.....	.....	.....	1936-39	.....
Imhoff, Eldon A. ....	.....	.....	.....	.....	.....	1947-50	.....
Jackson, Dugald C. ....	.....	.....	.....	1906-07	.....	.....	.....
Jackson, George L. ....	.....	.....	1954-55	.....	.....	1952-54	.....
Jackson, Wm. B.	1915-16	.....	.....	.....	.....	.....	.....
Jacobson, A. F. ....	.....	.....	.....	.....	.....	1952	.....
Johnson, Hjalmar W. ....	.....	.....	.....	.....	.....	1953-	.....
Johnson, Thos. T.	1897-98	1896-97	1895-96	.....	.....	.....	.....
Junkersfeld, Peter ....	.....	1909-10	1908-09	.....	.....	.....	.....
Kahler, W. V.	1947-48	1946-47	1945-46	.....	.....	1944-45	.....
Keith, Leigh S. ....	.....	1934-35	1933-34	1932-33	1928-32	.....	1935-47
Kinney, Wm. M. ....	.....	.....	1918-19	.....	.....	.....	.....
Knowles, C. R. ....	.....	.....	1934-35	.....	.....	.....	.....
Koflat, Alf ....	.....	.....	.....	.....	.....	1953-	.....
Kucho, Joseph ....	.....	.....	.....	.....	.....	1954-	.....
Kurtz, W. O.	1930-31	.....	1929-30	1928-29	.....	.....	.....
Lane, F. H.	1941-42	1940-41	.....	1939-40	.....	1936-39	.....
Lane, Moses ....	.....	1880-82	.....	.....	.....	.....	.....
Layfield, E. N. ....	.....	.....	1907-08	.....	.....	.....	1915-17
LeClair, Titus G.	1946-47	1945-46	.....	.....	1942-45	1937-40	.....
Lee, E. H.	1914-15	.....	.....	.....	.....	.....	.....
Lenth, Geo. C. D.	1916-19
Libberton, J. H.	1920-21
Liljencrantz, G. A. M.	1905-06	1895-98

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Lowell, J. W.						1921-22	
Loweth, C. F.	1908-09		1905-06				
McClure, R. J.						1880-87	
McClurg, V. O.	1948-49	1947-48	1946-47			1942-45	
McCullough, Ernest		1915-16	1914-15			1911-14 1916	
McElroy, Samuel			1885-86 1889-90				
McHarg, W. S.						1882-85	
MacDowell, C. H.	1921-22						
Macomb, J. deN.						1946-49	
MacRitchie, Chas.		1889-90					
Mapes, L. R.	1939-40	1938-39	1937-38	1936-37		1933-36	
Marston, W. R.						1951-54	
Mason, Roswell B.	1869-70						
Massey, Geo. B.						1939-42	
Mead, Daniel W.		1894-95		1908-09			
Mee, Charles L.						1952-	
Melcher, C. W.					1898-00		
Merrill, Mrs. Dot						1952-53	
Miller, K. B.		1919					
Modjeski, Ralph	1903-04	1902-03			1900-02		
Monroe, Wm. S.	1929-30	1928-29	1927-28				
Morehouse, L. P.		1895-96			1869-80		1869-88
Morison, Geo. S.						1893-96	
Morrow, F. E.	1926-27	1925-26	1924-25				
Morse, C. A.	1923-24		1922-23				
Nagler, K. B.						1935-38	
Nethercut, Edgar S.							1917-35
Newell, F. H.				1916-17			

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Nichols, Geo. P.						1898-01	
Niesz, Homer E.	1925-26	1924-25			1921-23		
Niles, Thomas M.						1953-	
Noble, Alfred	1898-99	1897-98	1896-97				
Northway, W. R.			1890-91				
Nourse, Edwin G.					1893-94		
Nutt, H. C.						1880-82	
Osborn, C. M.					1936-37		
Paine, Charles	1870-73						
Parkhurst, H. W.	1904-05	1903-04			1889-90		
Penn, Henry						1946-49	
Pence, W. D.				1904-05			
Pope, Willard S.	1882-83						
Powell, Ambrose V.	1900-01		1898-99		1887-88		
Putnam, Rufus W.	1927-28	1926-27	1925-26	1924-25			
Randall, Frank A.						1935-38	
Randolph, Isham	1892-93	1884-85	1883-84				
Reichmann, Albert	1913-14				1906-13		
Rettaliata, John T.						1952-	
Reynolds, James J.		1898-99	1897-98			1901	
Rich, E. P.						1926-29	
						1934-35	
						1908-11	
Ritter, L. E.							1895-96
Roney, Chas. J.							
Roper, D. W.		1916-18	1916				
Rust, H. A.		1893-94				1887-90	
Seaton, George L.						1952-	
Sedwick, H. P.	1950-51	1949-50	1948-49			1945-47	

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Seymour, W. O.			1891-92				
Shailer, Robert A.		1890-91					
Shankland, F. C.				1912-13			
Shapiro, B. B.				1921-22			
Skog, Ludwig						1949-52	
Smith, Homer K.						1945-48	
Smith, O. G.						1954-	
Smith, W. Sooy	1877-80					1883-86	
Snow, T. W.						1904-07	
Steger, Donald V.							1947-49
Strasser, R. J.						1937-40	
Strobel, C. L.						1892-95	
Sullivan, John F., Jr.	1954-55	1953-54	1952-53		1950-52		
Sykes, Wilfred						1948-51	
Talbot, A. N.				1907-08			
Townsend, H. C.						1943-46	
Turneure, F. E.			1903-04				
Turner, Ralph E.						1945-48	
Van Gorp, Dick						1954-	
Van Pelt, J. R.	1936-37	1935-36				1934-35	
Vore, M. P., Jr.					1948		
Wallace, John F.	1896-97	1891-92					
Warder, J. H.							1901-15
Webb, C. Earl	1943-44	1942-43	1941-42			1940-41	
Westburg, Paul A.	1938-39	1937-38	1936-37	1935-36	1932-34		
Weston, C. V.						1929-32	
Weston, John W.		1888-89			1890-93		1889-94
White, Linn				1920-21			
Whiting, F. T.						1948-51	

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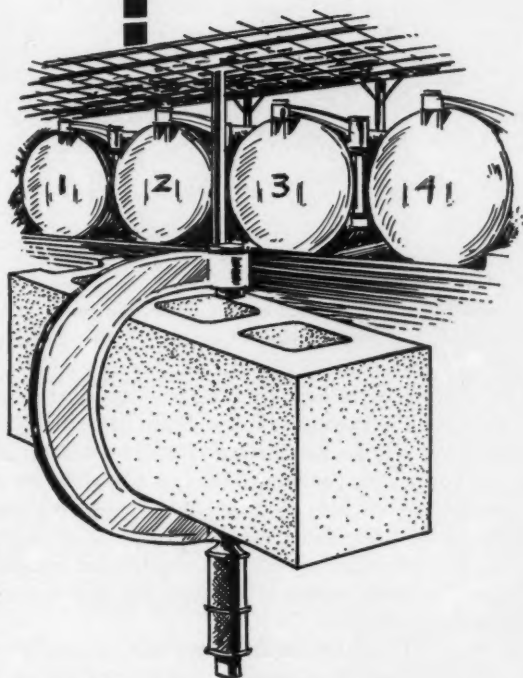
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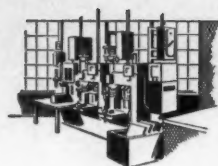
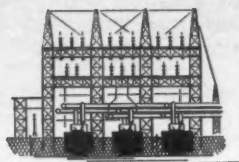
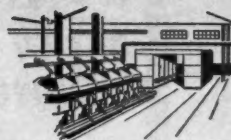
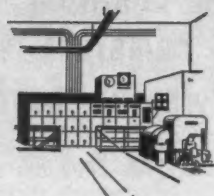
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Whitney, Nelson O.....		1899-00					
Whitridge, John C.....					1902		
Whittemore, D. J.....			1886-87				
Whittier, C. C.....	1934-35	1933-34	1932-33	1930-32		1927-30	
Williams Benezette	1885-86					1878-80*	
Wisner, G. M.....						1905-08	
Witt, J. C.....			1949-50				
Woodworth, P. B.....				1915-16			
Wright, Augustine W.....	1886-87		1884-85			1885-86	
Young, Hugh E.....						1941-44	
Ziesing, August						1899-02	

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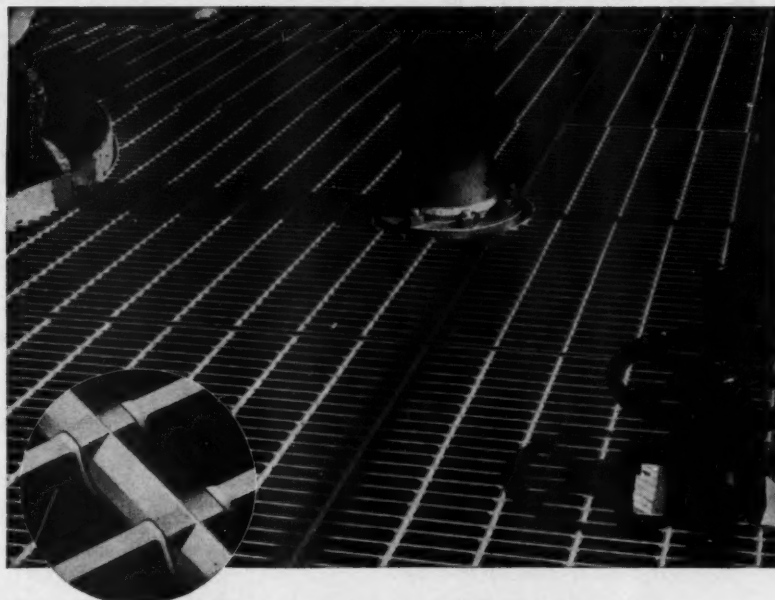
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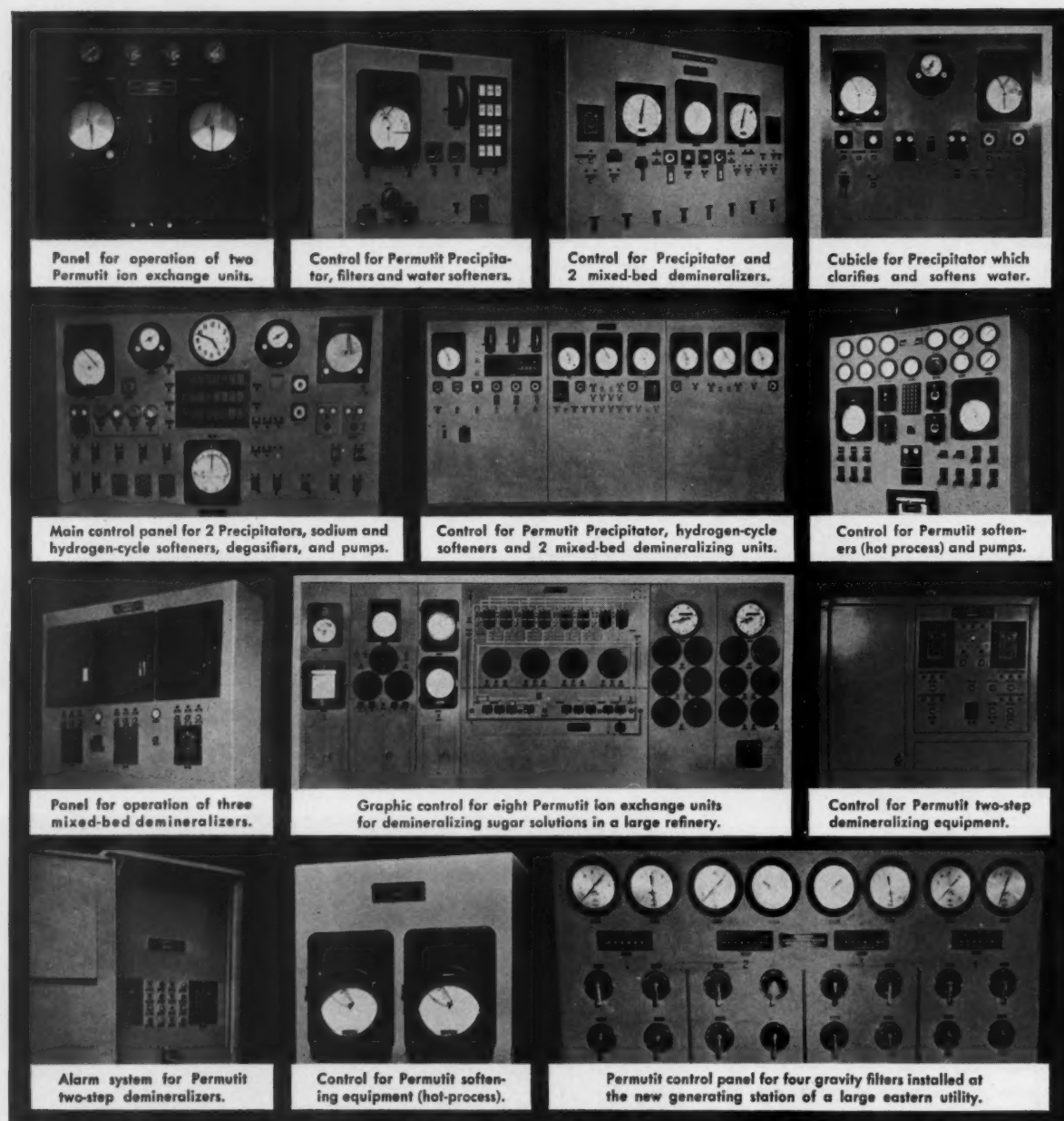
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Octave Chanute.....	1- 5-09	Onward Bates.....	3-22-22	John W. Alvord.....	4-28-31
Grenville M. Dodge.....	5-20-09	Robert W. Hunt.....	3-22-22	C. F. Loweth.....	4-28-31
D. J. Whittemore.....	12- 6-10	Samuel Insull.....	6- 2-26	John F. Stevens.....	10-29-35
Geo. W. Goethals.....	1-22-15	Ralph Modjeski.....	6- 2-26	Benjamin F. Affleck.....	9-26-38
John E. Blunt.....	1-10-17	Bion J. Arnold.....	6- 1-27	George Terry Horton.....	1- 7-44
Alonzo W. Paige.....	1-10-17	Arthur N. Talbot.....	6- 1-27	Daniel Webster Mead.....	1- 7-44
		E. C. Carter.....	6- 5-29	William S. Monroe.....	4- 4-46
				Burdick, Chas. B.	4- 4-46

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Springer, George B. ('90,LM), 11-30-52
 Zachary, Joseph L. ('47,Aff.), 1-7-54
 Jeppesen, Gunni ('12,LM), 1-20-54
 Prell, John S. ('98,LM), 1-30-54
 Van Trump, Isaac ('14,LM), 2-8-54
 Terrey, William H. ('24,M), 2-22-54
 Mac Dowell, Charles H. ('19,LM), 3-14-54
 Cox, Claude E. ('37,M), 3-22-54

Mann, L. B. ('44,Aff.), 3-27-54
 Fry, August J. ('19,LM), reported 4-24-54
 Liewehr, Edith C. ('50,M), 4-26-54
 Hammer, Mahlon J. ('13,LM), reported 5-14-54
 Carlson, Martin F. ('36,M), 5-26-54
 Scaar, Harry ('48,M), 6-1-54
 Trees, Merle J. ('09,LM), 8-6-54
 Conrad, C. L. ('53,M), 9-15-54

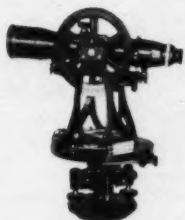
Brooks, Chason W. ('04,LM), 9-20-54
 Fucik, E. James ('02,LM), 9-28-54
 Painten, Edwin L. ('46,M), 12-4-54
 Armstrong, H. G. ('18,LM), reported 12-21-54
 Gosswein, O. H. ('20,LM), 1-1-55
 Tingley, Egbert M. ('28,M), 1-11-55
 Dencer, Frederick W. ('09,LM), 2-11-55

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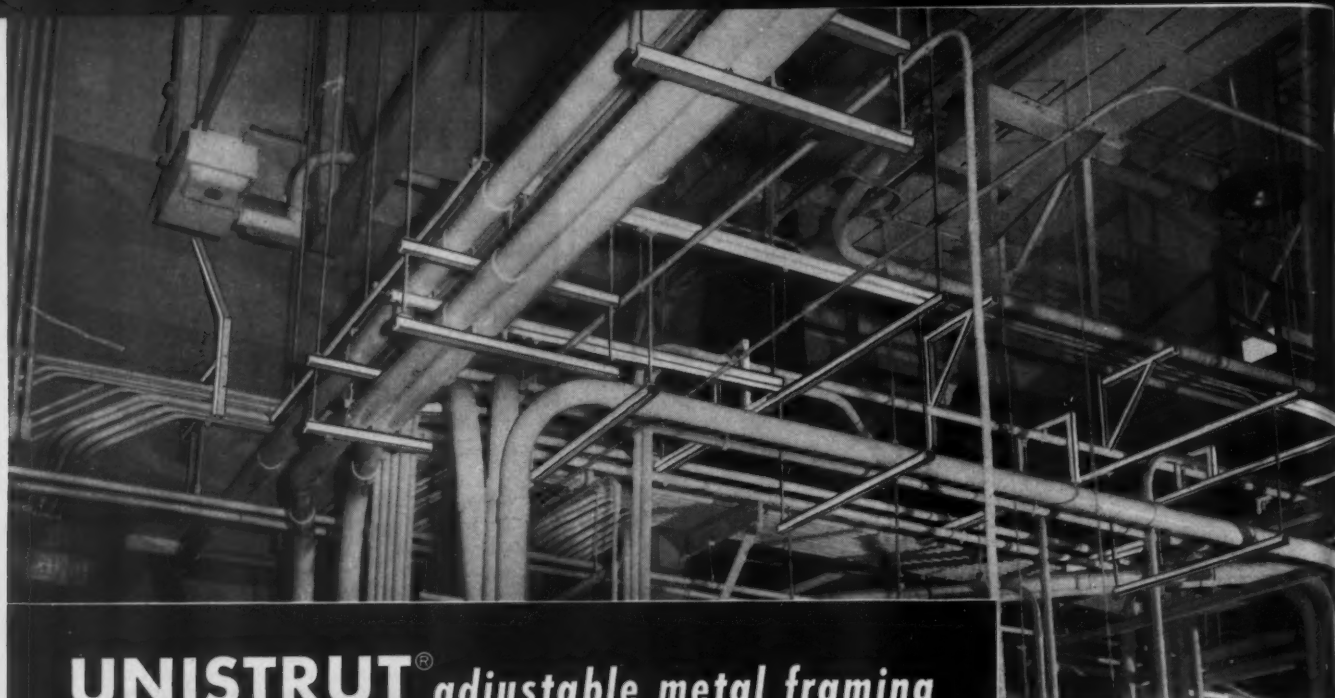
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2541908 Other Patents Pending



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Most really serious cracks are too small to be seen even with microscopes or by penetrating rays. Other serious defects are also invisible, such as seams in metal bars, lack of bond in welds, porosity in castings, etc.

Many inspection methods have been developed by Magnaflux which make these defects visible. They test all metals, ceramics and plastics, and even concrete and clayware! They do not harm the part tested and can be used anywhere.

These inspection methods by Magnaflux treat each part quickly. They build up an easily seen "indication" right on the defect. These are usually lines of powder, or bright colored oils. The most widely used are fluorescent, to put a glowing line of light on the defect like that you see in the photo above. The cost: as low as 1/8¢ per part!

If cracked parts may be costly to you, write for specific information, or the free and interesting booklet, "Seeing Isn't Always Believing".

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(Continued on Page 168)

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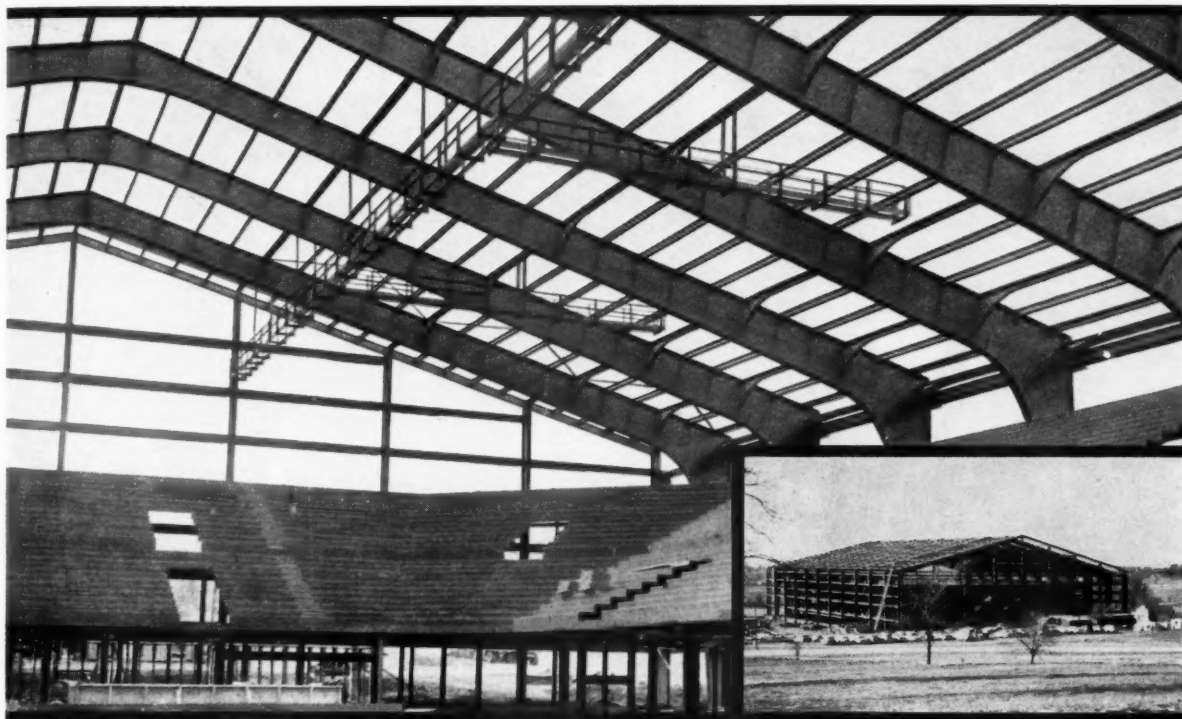
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